USDA

United States
Department of
Agriculture

Forest Service

Tongass National
Forest

R10-MB-493

May 2004

HECETA

Commercial Thinning Study Environmental Assessment

ACRONYMS

ACHP	Advisory Council On Historic Preservation
ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AFRPA	Alaska Forest Resources and Practices Act
AHMU	Aquatic Habitat Management Handbook
ANCSA	Alaska Native Claims Settlement Act (1972)
ANILCA	Alaska National Interest Lands Conservation Act (1980)
ASQ	Allowable Sale Quantity
BA	Biological Assessment
BE	Biological Evaluation
BMP	Best Management Practice
CCF	One Hundred Cubic Feet
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRM	Copper River Meridian
CT	Commercial Thinning
CZMA	Coastal Zone Management Act (1972)
DBH	Diameter (of a tree) at Breast Height (about 4.5 feet high)
DFC	Desired Future Condition
DOF	Division of Forestry (Alaska Department of Natural Resources)
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FONSI	Finding of No Significant Impact
FSH	Forest Service Handbook
FSL	Forestry Sciences Laboratory
FSM	Forest Service Manual
FVS	Forest Vegetation Simulator
GIS	Geographic Information System
GMU	Game Management Unit
GPS	Global Positioning Unit
HCA	Habitat Conservation Area
HUC	Hydrologic Unit Code (United States Geographic Service)
IDT	Interdisciplinary Team
LCR	Live Crown Ratio
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
MA	Management Area
MIS	Management Indicator Species
MMI	Mass Movement Index
NEAT	NEPA Economic Analysis Tool
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act (1976)
NFS	National Forest System
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NWI	National Wetland Inventory
OG	Old Growth
OGR	Old-growth Reserve
PNW	Pacific Northwest Forest and Range Experiment Station
POG	Productive Old Growth
R10	Region 10 (Alaska Region of Forest Service)
RCS	Road Condition Survey
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RPA	Forest and Rangeland Renewable Resources Protection Act (1974)
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
TES	Threatened, Endangered, Sensitive (species)
TTRA	Tongass Timber Reform Act (1990)
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VCU	Value Comparison Unit
VPA	Visual Priority Area
VPOP	Viable Population Committee
VQO	Visual Quality Objecctive
VRM	Visual Resource Management
WAA	Wildlife Analysis Area
WSRA	Wild and Scenic Rivers Act

United States Department of Agriculture
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File Code: 1950/2430

Date: April 27, 2004

Dear Reviewer:

This is your opportunity to comment on the environmental assessment (EA) for the proposed Heceta Commercial Thinning Study project on the Thorne Bay Ranger District, Tongass National Forest. This letter is our second request for comment on this proposed action before a final decision is made. Comments received during the initial scoping for the project in September 2000 are addressed in this EA.

This environmental assessment presents the purpose and need for the proposed project. It describes the proposed action, objectives, and the environmental effects of implementing the project.

Your comments are welcome and will be most useful if they are specific to this proposed action. Forest Service regulations define "substantive comments" (36 CFR 215.2) as "Comments that are within the scope of the proposed action, are specific to the proposed action, have a direct relationship to the proposed action, and include supporting reasons for the Responsible Official to consider."

It is your responsibility to submit comments by the close of the 30-day comment period. Comments will be accepted for 30 calendar days following the publication of a notice in the Ketchikan Daily News. Publication is scheduled for May 10, 2004. Please check the "legal notice" section of the newspaper for our notice.

Your comments need to include:

1. Your name and mailing address (a telephone number is optional)
2. The project title "Heceta Commercial Thinning Study EA"
3. Your organization name if you are commenting as a representative
4. Your signature is required for appeal eligibility (a scanned signature is accepted on email)

To comment by email, use a format compatible with MS Word and send to:

comments-alaska-tongass-thorne-bay@fs.fed.us Subject Line: comments-heceta

Written comments must be sent to the following address:

Thorne Bay Ranger District
Attn: Heceta CT Study EA
PO Box 19001
Thorne Bay AK 99919

Or FAX comments to: 907-828-3902

You can hand deliver comments to the Thorne Bay Ranger District office Mon-Fri, 8am-5pm (except May 31, Memorial Day). You can also arrange to make oral comments. For more information you can call Dennis Sylvia, Zone Planner (907) 828-3226 or Chuck Klee, IDT Leader (907) 828-3229.

The U.S. Department of Agriculture (USDA) is an equal opportunity provider and employer.

Sincerely,

DAVID E. SCHMID
District Ranger

Heceta Commercial Thinning Study Environmental Assessment

Thorne Bay Ranger District

Tongass National Forest

USDA Forest Service, Alaska Region

Lead Agency	USDA Forest Service Tongass National Forest
Responsible Official	David E Schmid, District Ranger Thorne Bay Ranger District Thorne Bay, Alaska
For Further Information Contact	Dennis Sylvia, Zone Planner 907-828-3226
or	Chuck Klee, IDT Leader 907-828-3229
Mailing Address	Thorne Bay Ranger District Attn: Heceta CT Study EA PO Box 19001 Thorne Bay, AK 99919

Abstract

The Forest Service proposes to commercially thin and study older second-growth timber on eastern Heceta Island. The USDA Forest Service, through the Pacific Northwest Research Station, Forestry Sciences Laboratory (FSL), Juneau, Alaska, would establish and monitor long-term study plots. The study would evaluate the effectiveness of commercial thinning second growth on understory and overstory stand development. Heceta Island was selected for this study because it has the largest concentration of older second growth on the Thorne Bay Ranger District. Thinning would take place on 400 acres in five proposed units in the 18,665-acre project area. The units are forested by 50- to 70-year-old second-growth timber. Between 25 and 50 percent of the timber volume in the units would be thinned, 2.6 miles of new road would be constructed, and 16.5 miles of existing road would receive reconstruction and maintenance. One small bridge and four culverts that block fish passage would be replaced. This proposed project is designed to employ an adaptive management approach to the study of commercial thinning. It proposes limited thinning of second growth in an Old-growth Habitat land use designation (LUD), portions of beach fringe over 500 feet from shoreline, and selected areas of high vulnerability karst.

How to Read This Environmental Assessment

The Forest Service has prepared this environmental analysis (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant state laws and regulations. This EA discloses the direct, indirect, and cumulative environmental effects resulting from the proposed action. It also provides supporting information for a determination to prepare a Finding of No Significant Impact (FONSI). Other reference documents, such as the *Tongass Land and Resource Management Plan* (Forest Plan) and the *Tongass Timber Reform Act* are available at public libraries and at the Forest Supervisor's Office in Ketchikan. The Forest Plan is also available on CD-ROM and on the internet at http://www.fs.fed.us/r10/ro/projects-plans This EA is prepared according to the format established by Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508).

The planning record for the Heceta Commercial Thinning Study project includes all project-specific information, including resource reports and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record is located at the Thorne Bay Ranger District office in Thorne Bay, Alaska, and is available for review during regular business hours by arrangement. Call Dennis Sylvia, Planner at 907-828-3226. Information from the record is available upon request.

Much of the Tongass National Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in the analyses of these data. GIS data is available in tabular (numerical) format, and as plots displaying data in map format. For this EA, all the maps, and most of the numerical analyses, are based on GIS resource data.

Chapter 1 explains the purpose and need for the proposed action, discusses how the project relates to the Modified 1997 *Tongass Land and Resource Management Plan* (Forest Plan), and any internal concerns or issues raised through public scoping efforts.

Chapter 2 describes and compares the proposed action and a no-action alternative, lists the mitigation measures for the project, lists the key indicators used to measure the effects of alternatives, and summarizes the environmental effects.

Chapter 3 describes the natural and human environments potentially affected by the proposed action and discloses the potential effects by resource.

Chapter 4 contains the list of preparers, the environmental assessment distribution list, literature cited, and a glossary of terms (a list of acronyms is inside the front page).

This environmental assessment incorporates documented analyses by summarization and reference where appropriate.

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Chapter 1

Purpose and Need

PROPOSED ACTION

The Forest Service proposes to commercially thin and study older, overstocked second-growth timber on east Heceta Island. The USDA Forest Service, through the Pacific Northwest Research Station, Forestry Sciences Laboratory (FSL), Juneau, Alaska, would establish and monitor long-term study plots in the thinning units. The purpose would be to evaluate the effectiveness of commercial thinning on second growth understory and overstory stand development.

The project originated because Southeast Alaska has large areas of second growth that is maturing to commercial size and there is a lack of site-specific data on how best to manage these areas. Heceta Island was selected for this study because it has the largest concentration of older second growth on the Thorne Bay Ranger District. This study of a commercial-sized thinning area would aid in planning future second growth management. Subsequent replications of the study in other areas with various site conditions would bring us closer to the goal of expanding knowledge about commercial thinning.

This proposed project is designed to employ an adaptive management approach to the study of commercial thinning. It proposes limited thinning of second growth in an Old-growth Habitat land use designation (LUD), portions of beach fringe at least 500 feet from the waterline, and selected karst areas. The Forest Plan Record Of Decision, page 1, paragraph 4 describes adaptive management as "Recognizing that conditions on the Tongass National Forest do not remain static and that new information is constantly being developed, the Forest Plan embraces an adaptive management approach. This approach refers to the continuous process of action-based planning, monitoring, research, evaluation, and adjustment, with the objective of improving implementation to achieve desired management goals and objectives."

In the *Karst Management Standards and Implementation Review, Final Report of the Karst Review Panel* (2002), the panel determined that commercial thinning of overstocked stands would hasten a return to more desirable stand conditions on past

harvest sites. The panel thinks this type of thinning could be safely conducted on low and moderate, and possibly selected high vulnerability karst sites.

Thinning second growth to improve wildlife habitat is proposed for limited portions of the beach fringe and the Old-growth Habitat land use designation (LUD) in the Port Alice unit. Forest Plan objectives provide for thinning to accelerate development of old-growth characteristics (Forest Plan p 3-76). Thinning is also encouraged for wildlife habitat restoration in the beach and estuary fringe (Forest Plan p 4-5).

The proposed action serves as a starting point for the interdisciplinary team, and gives the public and other agencies specific information on which to focus comments early in the scoping process. Using these comments and information from preliminary analysis, the interdisciplinary team develops alternatives to the proposed action. The alternatives are considered and either carried forward for more extensive analysis or eliminated from further detailed analysis. Alternatives considered and alternatives eliminated from further analysis are both discussed in Chapter 2.

- The project area would contain five thinning units totaling about 400 acres.
- Forestry Sciences Laboratory would establish permanent study plots where appropriate within the units.
- The commercial thinning study would include about 12,000 hundred cubic feet (CCF) of spruce and hemlock. Thinning would reduce the number of trees (stand density) by 25 to 50 percent.
- Logs would either be transported to the Forest Service log transfer facility (LTF) at Port Alice, or the State LTF at Camp Cove.
- About 2.6 miles of new road would be constructed.
- Twelve miles of road on the haul route would receive maintenance and 4.5 miles would be reconstructed.
- Four culverts that block fish passage and one log bridge would be replaced.

PROJECT AREA DESCRIPTION

Heceta Island is located west of Prince of Wales and Tuxekan islands, about 40 miles northwest of Thorne Bay, Alaska (Map 1-1). There are no residences on Heceta Island. There is one Forest Service LTF at Port Alice on the western edge of the project area, and one LTF on State land at Camp Cove, on the north central side of the project area. There is a Forest Service field camp at Port Alice.

There are 400 acres in five proposed units in the 18,665-acre project area (Map 1-2). The units are forested by 50- to 70-year-old second-growth timber stands. The project area includes portions of value comparison units (VCUs) 5580, 5590, 5610, and 5700. VCUs are comparable to large watersheds, and generally follow major watershed divides.

There are about 9,411 acres of densely stocked second growth and 86 miles of road in the project area. Fifty percent of the project area is in second-growth condition and road density is about 2.9 miles per square mile.

The stands are in a stage of development called stem exclusion. The stem-exclusion stage occurs when tree density increases to the point where the canopy closes and sunlight no longer reaches the forest floor. New trees do not appear and smaller existing trees die. Competition for site resources limits tree growth and vigor; which results in increased risk of insect and disease problems.

Overcrowding has severely reduced the herb and shrub cover necessary for wildlife habitat. The closed canopy conditions in the stands are promoting self-pruning of both spruce and hemlock. In general, limbs on the lower 16-32 feet are dead. The overstocked conditions that promote self-pruning also limit overall diameter growth (currently about 12 inches).

Timber harvest in the 1930s used corridors to yard logs to the beach. These yarding corridors are evident today as closed depressions with wetland characteristics. Sometimes ponds have formed in the depressions due to poor drainage. All karst areas in the units have been harvested in the past. These areas were beach logged without suspension requirements and much of the yarding occurred along existing karst channels. Sediment and wood debris have filled many of the karst features in the project area. Small surface streams that now drain into karst features have developed due to sedimentation and soil compaction along these yarding corridors (see Chapter 3 karst and hydrology).

The ground along cable corridors was highly disturbed because suspension logging was infrequently used. In some cases these corridors are still evident on the ground and on aerial photos. However, past activities do not appear to have adversely impacted the overall productivity of these stands. An organic soil mat has recovered the majority of the skidding areas (see Chapter 3 silviculture and soils).

Past road construction affected surface water flowpaths, fish passage and water quality by routing water through culverts and producing sedimentation. Altered flow paths and areas producing sedimentation along the road system were identified in the roads review (see Chapter 3 fisheries).

Past harvest likely had temporary and minor effects on wetland hydrology. A total of 31.1 acres of road was constructed in the project area. Road building permanently displaced wetlands in these areas. The majority of these wetlands (86 percent) were forested wetland. Wetlands with high biological and hydrological value were avoided and impacts minimized where practical (see Chapter 3 wetlands).

Table 1-1 Acres of land in the project area land use designations (LUDs)

Land Use Designation	Acres of Land	Percent of Project Area
Timber Production LUD	13,278	71%
Old-growth Habitat LUD	2,118	11%
Total Forest-owned land	15,396	82%
State-owned land in the project area	3,249	17%
Other land ownership in the Project Area	20	less than 1%
Total acres and percentage of the project area	18,665	100%

The Five Project Area Units

Crooked Hook Unit 1:

- 26 acres in Timber Production LUD
- 809 CCF harvest volume
- Accessed by NFS Road 1445500
- T70S, R78E, Section 22, CRM (Copper River Meridian)

Crooked Hook Unit 2:

- 30 acres in Timber Production LUD
- 934 CCF harvest volume
- Accessed by NFS Roads 1445, 1445500, and 1445520
- T70S, R78E, Section 22, CRM

Crooked Hook Unit 3:

- 142 acres in Timber Production LUD
- 4,419 CCF harvest volume
- Accessed by NFS Roads 1445, 1445520, and 1445730
- T70S, R78E, Sections 22, 23, 26, & 27, CRM

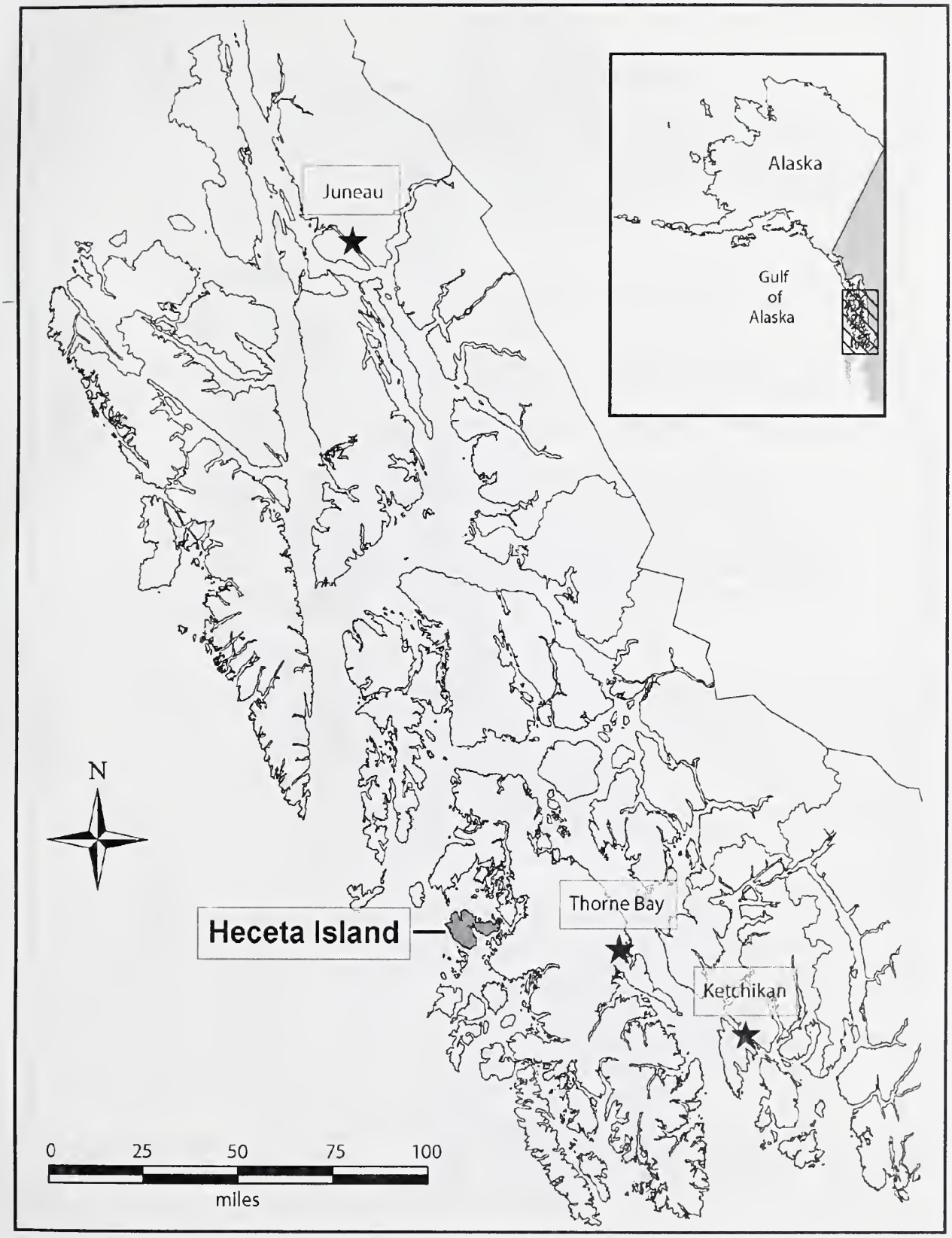
Port Alice Unit:

- 2 acres in Timber Production LUD and 35 acres in Old-growth Habitat LUD
- 1,151 CCF harvest volume
- Accessed by NFS Road 1445290
- T70S, R77E, Section 15, CRM

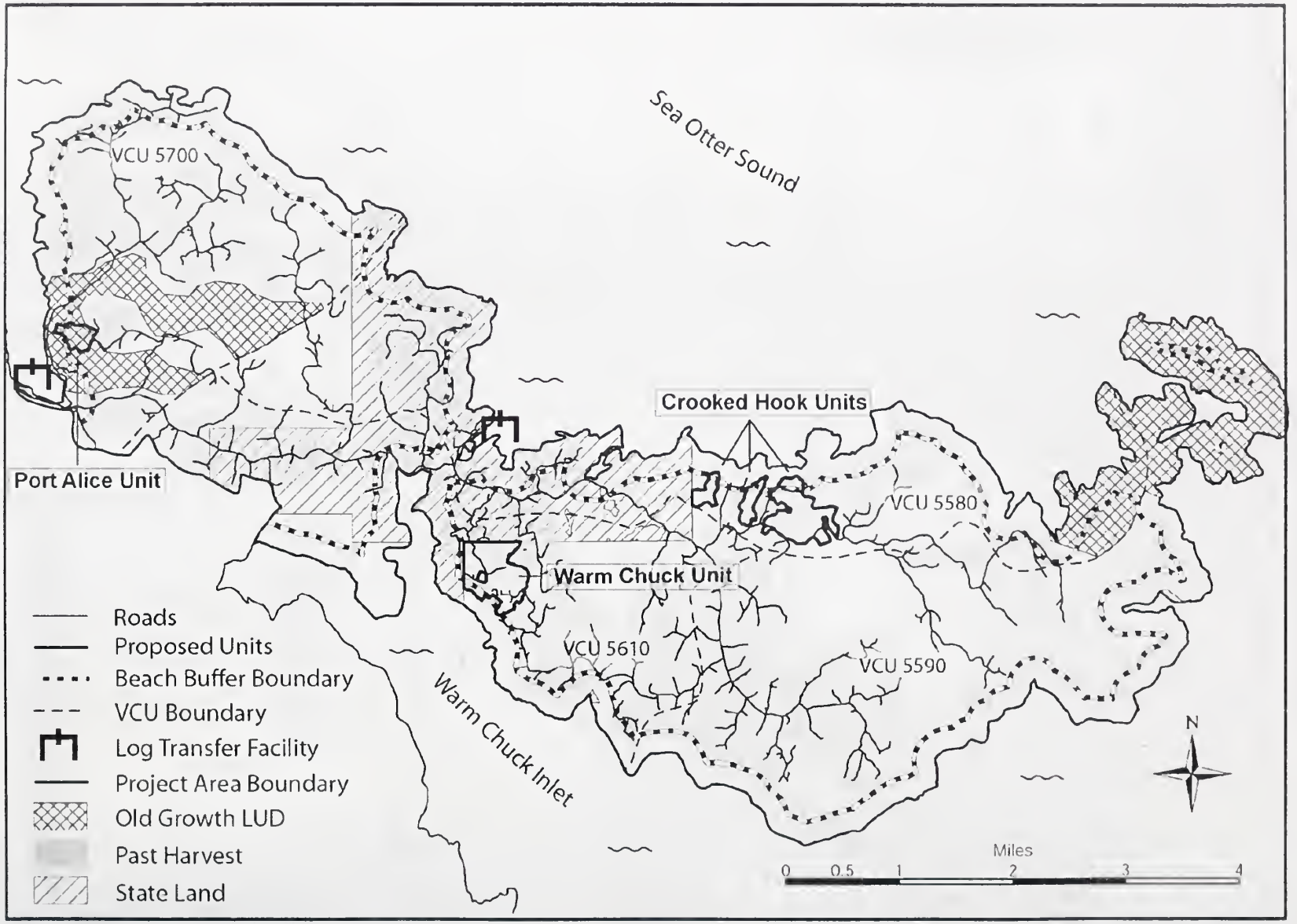
Warm Chuck Unit:

- 165 acres in Timber Production LUD
- 5,134 CCF harvest volume
- Accessed by NFS Road 1445630 and NFS/State Road 1445385
- T70S, R78E, Section 29, CRM

Map 1-1 Heceta Commercial Thinning Study Vicinity Map



Map 1-2 Heceta Commercial Thinning Study Project Area



PURPOSE AND NEED FOR ACTION

The Heceta Commercial Thinning Study would respond to the goals and objectives and help move the project area toward future conditions described in the 1997 *Tongass Land and Resource Management Plan* (Forest Plan). The Forest Plan includes forest-wide goals and objectives, and area-specific land use designation goals, objectives, and desired future conditions.

Project Objectives

The interdisciplinary team identified four objectives for the Heceta Commercial Thinning Study.

1. Improve future management of second growth by evaluating the effects of commercial thinning (see Chapter 3 timber and silviculture)
2. Improve the health and vigor of second-growth stands (see Chapter 3 timber and silviculture)
3. Improve wildlife habitat and biodiversity by thinning second growth to encourage understory forage (see Chapter 3 wildlife)
4. Capture wood production in overstocked stands that may be otherwise lost to mortality and decay, and generate local timber-related economic opportunities by implementing intermediate harvest treatments (see Chapter 3 timber and silviculture)

Improve Future Management of Second Growth

Few areas have been commercially thinned in Southeast Alaska. The number of second-growth stands available for this type of treatment will increase in the future (see Chapter 3 timber and economics). An estimated 650,000 acres of second growth on the Forest will reach maturity over the next 50 years. There is a need to develop information on the effects of thinning older second growth stands. The Forestry Sciences Laboratory study would "provide information to evaluate the effects of commercial thinning in even-aged and two-aged western hemlock/Sitka spruce stands in Southeast Alaska." (FSL Study Plan).

The FSL study would assess the response of forest resources to different commercial thinning treatments in a formal study and information would be published in a technical report. Aspects such as forest structure, stand growth and yield, tree damage agents, understory plant diversity and lumber grade and yield would be included in the study. The project would also yield information on sale preparation and implementation costs, merchantability of second-growth products, degree of collateral damage suffered by retained trees, and changes in wildlife use patterns in response to various thinning treatments. (Forest Plan p 3-142)

Improve Health and Vigor of Second-growth Stands

There is a need to improve tree health and vigor in overstocked second-growth stands. Overstocked conditions are characterized by high numbers of Sitka spruce and western hemlock trees per acre, dense unbroken canopy, and little or no understory vegetation.

Trees growing in overstocked conditions tend to become tall and slender, making them more susceptible to breakage from wind, snow and ice. The crowns of trees tend to become smaller; which causes trees lose their ability to respond to additional growing room created by silvicultural treatments. Forest Plan objectives for old-growth habitat allow for thinning to "accelerate forest succession to achieve old-growth forest structural features" (Forest Plan p 3-76). The Forest Plan objectives for Timber Production LUD include improving timber growth and productivity on commercial forest land (Forest Plan p 3-144).

Improve Wildlife Habitat and Biodiversity

There is a need to determine if reducing second-growth stand densities would improve habitat conditions for wildlife. Densely stocked stands have few herbs or shrubs that provide critical deer winter range. They also lack the understory structural complexity in forage and cover that is required for many small mammal species; which are prey for raptors. Information from this project would help managers evaluate how commercial thinning operations affect deer habitat and small mammal populations (Forest Plan pp 2-2 to 2-5, 3-142).

Capture Wood Production and Generate Local Employment

There is a need to capture wood production in overstocked stands that may be otherwise lost to mortality and decay. There is also a need to generate local timber-related economic opportunities through timber harvest. Commercial thinning offers an opportunity to eliminate overcrowding, increase growth of the remaining trees, and make use of the wood products (Forest Plan p 3-142).

There is a need to manage forests in a manner that ensures an adequate, sustainable supply of wood fiber is available to meet the Forest timber program goals (Forest Plan p 3-144). Forest resource sustainability has a positive effect on local communities. National Forest Service lands contribute to the economy of Prince of Wales Island and the surrounding area through timber sales. The local timber industry provides wood products to local and regional markets. The amount of timber harvest affects income and employment opportunities. Commercial thinning would help ensure that an adequate, sustainable supply of wood fiber is produced from National Forest Service lands (Forest Plan p 2-4).

Background on Commercial Thinning

The forests of Southeast Alaska have simple tree species composition but complex forest age and size structure. Over 90 percent of the region's volume is Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*). The project area is a mix of even-aged and two-aged forest stands harvested over the past 70 years. Even-aged stands are the result of clearcutting. The two-aged stands were created when Sitka spruce was harvested, leaving a residual hemlock overstory. Similar two-aged timber harvest prescriptions are implemented today on the Tongass.

Commercial thinning (CT) is an "intermediate" silvicultural treatment; which results in an uneven-aged stand where some or all of the wood harvested is put to use (Wenger, 1984 p 420). "Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis."

(Helms, 1998 p 167) Simply put, silviculture is the management of Forest vegetation to meet Forest objectives.

Stand Development Stages

Forest stand development has clearly defined patterns following disturbance such as clearcutting, windthrow, or fire. The proposed project units are in the stem exclusion stage of stand development. The four stages of stand development are Stand Initiation, Stem Exclusion, Understory Re-initiation, and Old Growth (Oliver and Larson 1996 p143). The stand development stages are represented in Figure 1-1

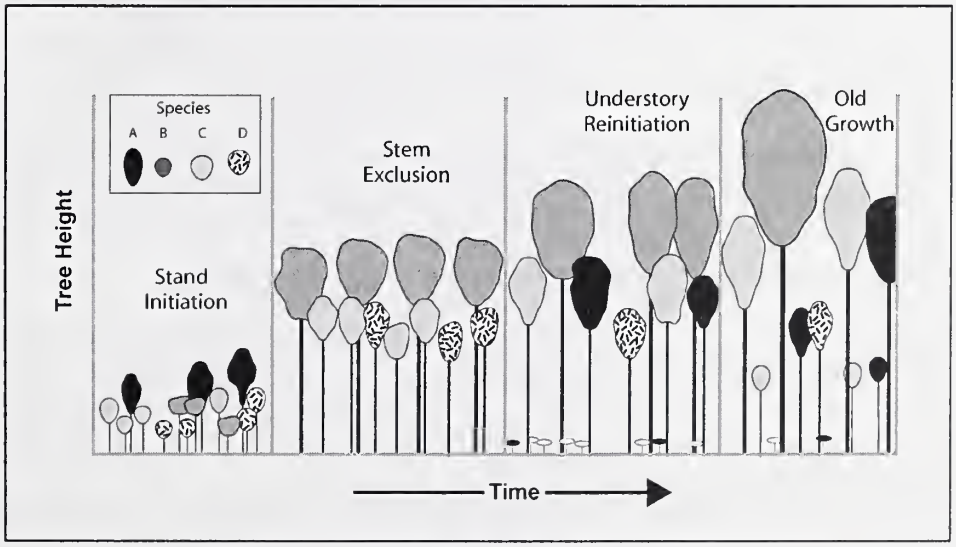
Stand Initiation - In the 'stand initiation' stage, conifer regeneration, shrubs, and herbaceous plants are rapidly established following disturbance (Oliver and Larson 1996). Understory plant biomass peaks around 15 to 25 years after clearcutting (Alaback 1982 p 1938).

Stem Exclusion - Canopy closure occurs 25 to 35 years after clearcutting. It is followed by an intense period of tree competition that prevents new tree and brush regeneration. This condition is called the 'stem exclusion' stage. The developing young growth becomes extremely dense and has relatively uniform tree height and diameter. This stage of understory exclusion can last for 30 to 100 years or longer (Alaback 1984 p 7). Stands in this stage lack the multi-layered, diverse structures found in old growth or multi-aged stands.

Understory Re-initiation - Disease, insects and wind disturbances in stem exclusion stands can create gaps in the canopy and result in a new mix of tree species and other understory vegetation. This condition is the 'understory re-initiation' stage.

Old Growth - The 'old-growth' stage occurs much later as these stands mature and become old (200+ years); disturbances provide openings for younger trees and shrubs; and older trees fall over creating openings and downed woody debris.

Figure 1-1 Stand development stages



This graphic is based on Figure 5.2 on page 143 of *Forest Stand Dynamics* by Bruce C Oliver

and Chadwick D Larson, 1990.

The long-lasting stage of understory exclusion affects tree vigor and diameter growth. It also affects wildlife that depends on understory plants for forage (Walmo and Schoen 1980 p 460). Young growth provides greater understory biomass than old growth for the first 15 to 25 years after clearcutting (Alaback 1982 p 6). However, the young stands provide less cover and are much less important for deer habitat in the winter (Rose 1984 p 289; Kirchhoff and Schoen 1987 p 31).

FORESTRY SCIENCES LABORATORY THINNING STUDY

Research by the USDA Forest Service, Forest Sciences Laboratory (FSL) in Juneau, Alaska would take place concurrently with the proposed project. The FSL study would be designed to determine the affects of commercial thinning on overstory and understory development in Southeast Alaska. Between 25 and 50 percent of the volume would be harvested, depending on the type of treatment. Some areas in the units would not be treated and would therefore serve as 'controls' to compare the various treatments against the existing condition.

The FSL and other Forest Service personnel selected four objectives for this study.

1. Determine how commercial thinning affects height and diameter growth rates, amount and composition of tree regeneration, crown length and width, tree canopy layer, and growth of residual trees.
2. Determine how understory vegetation responds to various commercial thinning treatments and the effect these treatments have on the quantity and quality of forage important to wildlife.
3. Assess wood quality (i.e., lumber grade yield) of trees removed in commercial thinning and determine the long-term affects of commercial thinning on wood quality (potential of wood for different timber products, wood strength and stiffness, future wood quality of residuals).
4. Determine the amount of logging injury to the residual trees following commercial thinning. Determine how natural damage agents (mistletoe, fluting, wind, fungal decay, etc.) affect the residual stand.

The FSL research study plan will not be discussed in detail in this environmental analysis. The research would continue beyond this commercial thinning project. Results of the study would be documented by the FSL in future research reports.

DECISIONS TO BE MADE

The Thorne Bay District Ranger will decide if the Heceta Commercial Thinning Study should take place and how the thinning should be conducted. The decision will be based on the environmental analysis conducted for this environmental assessment and on the purpose and need for the project. There are three primary considerations for the decision.

1. The size and location of the thinning units, the miles of road construction and reconstruction, and whether roads should remain open or not.

2. The mitigation measures and monitoring activities required for the project.
3. Whether or not the action might significantly restrict subsistence uses.

RELATIONSHIP TO FOREST PLAN

The Heceta Commercial Thinning Study is a project-level analysis. Its scope is confined to addressing the environmental consequences of the proposed action. This environmental assessment does not attempt to address the decisions made at higher levels; but it does implement direction from higher levels such as the Forest Plan.

The Forest Plan provides direction for managing the land and resources of the Tongass National Forest. The Forest Plan embodies the provisions of the National Forest Management Act (1976, amended), its implementing regulations, and other guiding documents. Where appropriate, the Heceta Commercial Thinning Study tiers to the Forest Plan, as encouraged by 40 CFR 1502.20. This environmental assessment incorporates documented analyses by summarizing and citing them.

The two Land Use Designations (LUDs) in the project area are Timber Production and Old-growth Habitat. The Forest Plan describes goals, objectives, and desired future condition for these LUDs.

Timber Production LUD Goals & Objectives

- Maintain and promote industrial wood production from suitable timberlands; providing a continuous supply of wood to meet society's needs.
- Sustain long-term timber yields.
- Seek to provide a supply of timber that meets the annual and planning-cycle market demand; consistent with the standards and guidelines of this LUD.
- Apply the Visual Quality Objective (VQO) of Modification in the foreground distance zone as seen from visual priority travel routes and use areas. Apply the Maximum Modification VQO to all other areas.
- Locate and design timber harvest activities primarily to meet timber objectives.
- Seek to reduce clearcutting when other cutting methods will meet land management objectives.
- Improve timber growth and productivity on commercial forest lands.
- Plan, inventory, prepare, offer, sell and administer timber sales and permits to ensure the orderly development of timber production.
- Identify opportunities for diversifying the wood products industry (such as special forest products, and value-added local production).
- Plan a transportation network of roads and helicopter access that eventually will facilitate most of the suitable timber lands for standard logging or helicopter yarding systems.

Desired Condition: Suitable timberlands are managed for the production of sawtimber and other wood products on an even-flow, long-term sustained-yield basis; the timber yield produced contributes to the Forest-wide sustained yield. An extensive road system provides access for timber management activities, recreation uses, hunting and fishing, and other public and administrative uses; some roads may

be closed, either seasonally or year-long, to address resource concerns. Management activities will generally dominate most seen areas. Tree stands are healthy and in a balanced mix of age classes, from young stands to trees of harvestable age, often in 40- to 100-acre stands. Recreation opportunities, associated with roaded settings from Semi-primitive to Roaded Modified, are available. A variety of wildlife habitats, predominantly in the early and middle stages of succession, are present.

Old-growth Habitat LUD Goals & Objectives

- Maintain areas of old-growth forests and their associated natural ecological processes in order to provide habitat for old-growth associated resources
- Ensure that younger conifer stands achieve old-growth forest characteristic structure and composition based upon site compatibility
- Provide old-growth habitat, in combination with other LUDs

  To contribute to the habitat capability of fish and wildlife resources and to support sustainable human subsistence and recreational uses

  To maintain components of flora and fauna biodiversity and ecological processes associated with old-growth forests

  To allow existing natural or previously harvested young conifer stands to evolve naturally to old-growth forest habitats, or apply silvicultural treatments to accelerate forest succession to achieve old-growth forest structural features (consider practices such as commercial thinning, release and weeding, pruning, and fertilization to promote accelerated development of old-growth characteristics)

  To the extent feasible, limit roads, facilities, and permitted uses to those compatible with old-growth forest management objectives.

Desired Condition: For old-growth habitat, the desired future condition is that all forested areas attain old-growth forest characteristics and provide a diversity of old-growth habitat types, associated species, and ecological processes.

PUBLIC INVOLVEMENT

The Heceta Commercial Thinning Study was listed on the Tongass National Forest Schedule of Proposed Actions in the summer of 2000 and included in the Tongass National Forest ten-year timber sale plan. Both listings are available on the Internet (*www.fs.fed.us/r10/tongass*).

Public Mailing - In August 2000, a letter providing information and seeking public comment was mailed to 138 individuals and groups that had previously shown interest in Forest Service projects in Southeast Alaska. This included federal and state agencies, federally recognized tribes, Alaska Native Claims Settlement Act corporations and other Alaska Native groups, municipal offices, businesses, interest groups, and individuals. Nine responses to this initial mailing were received.

Local News Media - Announcements about the project were printed in the Ketchikan *Daily News* on September 3, 2000, and in the *Island News* on September 4, 2000.

LEGAL REQUIREMENTS

Federal and State Permits, Licenses, and Certifications

The following permits would be obtained as required before implementing this environmental assessment:

U.S. Army Corps of Engineers - Approvals for discharge of dredged or fill material into waters of the United States (Section 404 of the Clean Water Act of 1977, as amended). Approve construction of structures or work in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899).

U.S. Environmental Protection Agency - Storm water discharge permit National Pollutant Discharge Elimination System review (Section 402 of the Clean Water Act)

State of Alaska, Department of Natural Resources - Authorization for occupancy and use of tidelands and submerged lands

State of Alaska, Department of Environmental Conservation - Certification of compliance with Alaska Water Quality Standards (Section 401 Certification). Solid Waste Disposal Permit (Section 402 of the Clean Water Act)

U.S. Coast Guard - Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946) required for all structures constructed across navigable waters (within the tidal influence zone) of the United States

Applicable Laws and Executive Orders

Shown below is a partial list of federal laws and executive orders pertaining to project-specific planning and environmental analysis on federal lands. While most pertain to all federal lands, some of the laws are specific to Alaska.

Alaska National Interest Lands Conservation Act (ANILCA) of 1980

Alaska Native Claims Settlement Act (ANCSA) of 1971

American Indian Religious Freedom Act of 1978

Archeological Resource Protection Act of 1980

Cave Resource Protection Act of 1988

Clean Air Act of 1970 (as amended)

Clean Water Act of 1977 (as amended)

Coastal Zone Management Act (CZMA) of 1972 (as amended)

Endangered Species Act (ESA) of 1973 (as amended)

Executive Order 11593 (cultural resources)

Executive Order 11988 (floodplains)

Executive Order 11990 (wetlands)

Executive Order 12898 (environmental justice)

Executive Order 12962 (aquatic systems and recreational fisheries)

Forest and Rangeland Renewable Resources Planning Act (RPA) 1974 (as amended)

Magnuson-Stevens Fishery Conservation and Management Act of 1996

Marine Mammal Protection Act of 1972

Migratory Bird Treaty Act of 1918 (as amended)

Multiple-Use Sustained-Yield Act of 1960

National Environmental Policy Act (NEPA) of 1969 (as amended)

National Forest Management Act (NFMA) of 1976 (as amended)

National Historic Preservation Act of 1966 (as amended)

Tongass Timber Reform Act (TTRA) of 1990

Wild and Scenic Rivers Act of 1968, amended 1986

State of Alaska

Under the Coastal Zone Management Act (CZMA) of 1972, as amended, Forest Service activities and development projects that affect the coastal zone must be consistent to the maximum extent practicable with enforceable policies of the Alaska Coastal Management Program (ACMP). "Consistency determinations" are made by the Forest Service, and reviewed by the State of Alaska as required by the CZMA.

Under the Alaska Forest Resources and Practices Act (AFRPA) of 1979, as amended, Forest Service timber harvest projects satisfy the CZMA consistency requirement if the Forest Plan and related standards and guidelines applicable to the project provide no less resource protection than the AFRPA requires for timber harvest projects on State land, except that the AFRPA specifies a different minimum riparian standard for Federal projects than for State projects. Findings regarding consistency are included in Chapter 2.

Chapter 2

Alternatives

ALTERNATIVE DEVELOPMENT PROCESS

This chapter describes and compares the alternatives (potential actions) for the project. The Thorne Bay Ranger District initiated the Heceta Commercial Thinning Study Environmental Assessment in August 2000. A scoping letter requesting comments on the proposed action was mailed to individuals, organizations, and agencies on the mailing list for proposed projects. The mailing list included 21 Federal agencies, 13 State agencies and divisions, 29 Native and municipal offices, 42 businesses, organizations, and groups, and 33 individuals. Public notices for the 30-day scoping period were published in the Ketchikan Daily News on September 3, 2000, and in the Island News on September 4, 2000.

Nine responses to the scoping letter were received. The public comments were focused on the viability of the thinning proposal and the positive effects to local employment as well as the need to maintain or improve wildlife habitat. Timber and economics were identified as important resource considerations. Improving wildlife habitat was considered an important objective of the project that would be accomplished by implementing the proposed action.

The Interdisciplinary Team (IDT) identified as an important resource consideration the protection of significant karst features and high vulnerability karst. The team established a priority to protect karst from effects associated with the project while also thinning to within 25 feet of selected karst features in order to reduce stand overcrowding and canopy closure.

ISSUES

Karst Resource Protection

The IDT identified concerns about protecting karst features while thinning to return the forest canopy to a state closer to original levels before the past harvest activities.

Key Indicators for Karst:

Four key indicators were used to analyze the effects of the alternatives on karst.

1. Acres of high vulnerability karst in the units
2. Acres of high vulnerability karst thinned
3. Acres of moderate vulnerability karst in the units
4. Acres of low vulnerability karst in the units

Timber Demand and Economics

Public scoping identified concerns over the economic viability of the Heceta Commercial Thinning Project. The following concerns were identified:

Location – effect of mobilization costs on project viability such as moving equipment to the island and cost of transporting the wood to a mill for processing.

Roads – effect of road costs for construction, reconstruction and maintenance on project viability.

Wood Quality – effect of lower wood quality on project viability.

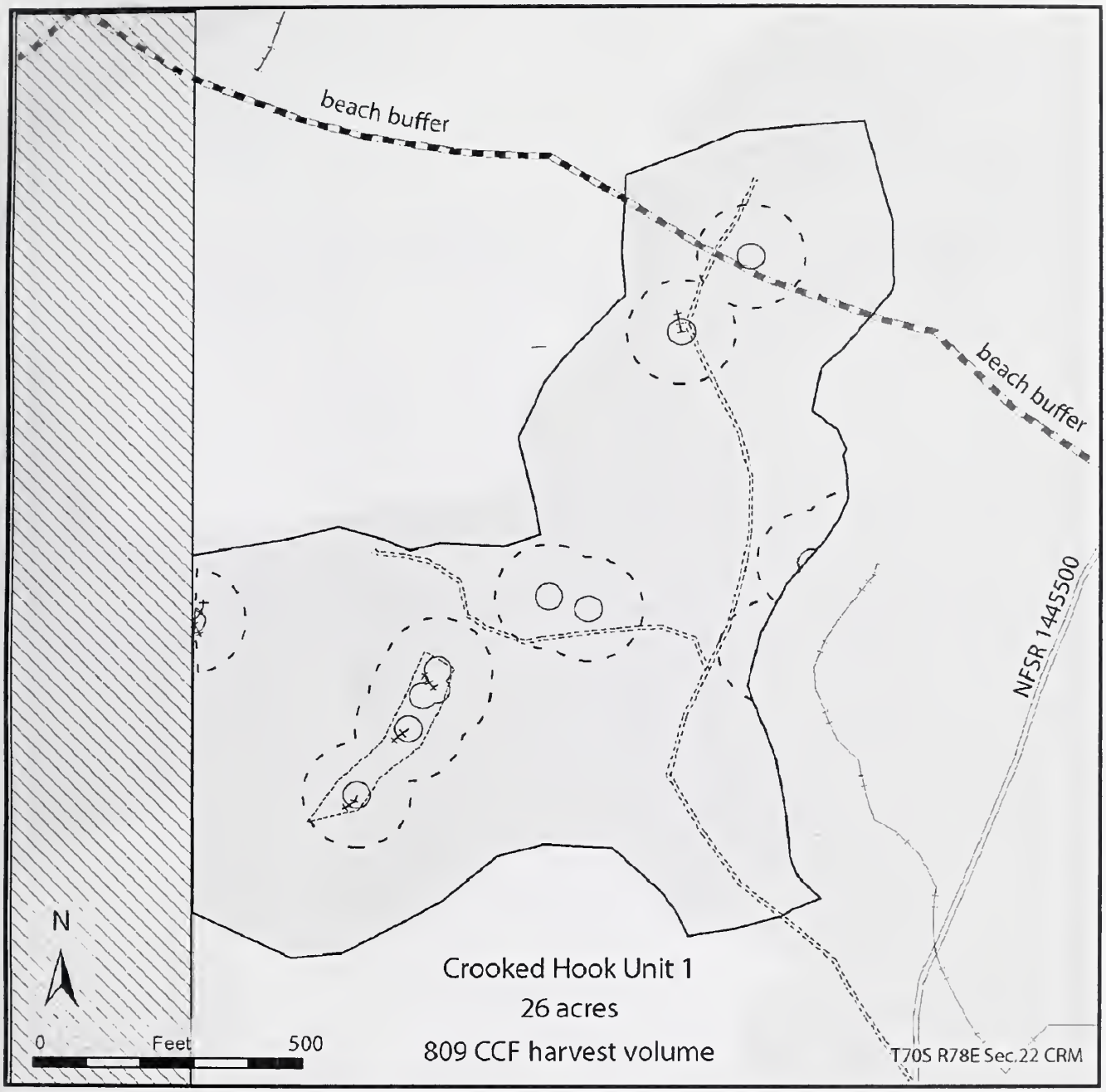
Other comments were supportive of commercial thinning. as more stands will become available for these treatments in the near future. Benefits identified include providing jobs and wood to maintain the timber industry.

Key Indicators for Timber and Economics:

Eight key indicators were used to analyze the effects of the alternatives.

1. Knowledge gained for future second growth management
2. Number and size of units
3. Estimated timber volume
4. Log grades and product quality
5. Supply of second growth
6. Demand for second growth
7. Timber sale economics
8. Socio-economics

Map 2-1 Crooked Hook Unit 1



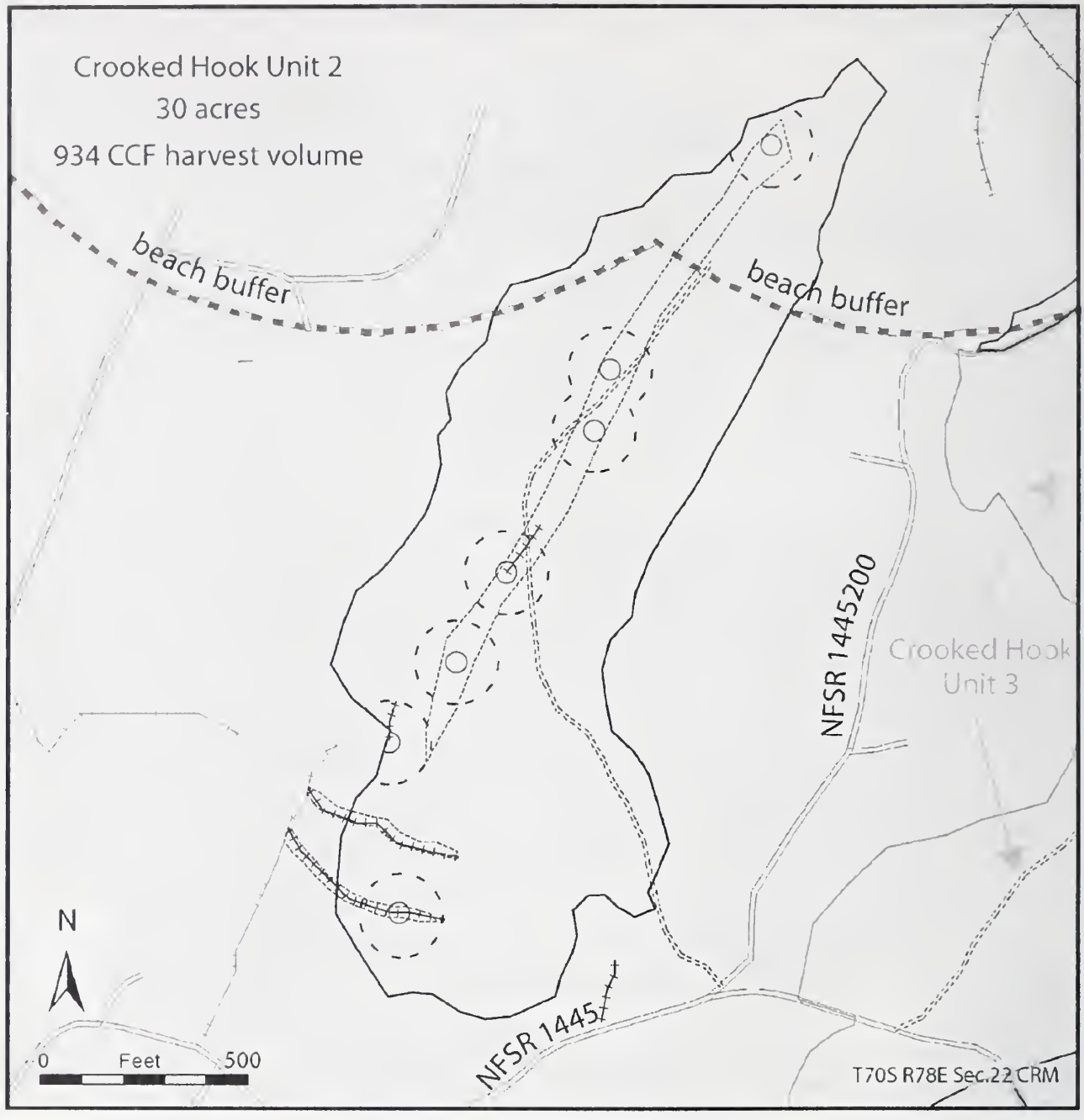
Streams
- Class I
- Class II
- Class III
- Class IV

Karst
- 25-ft buffer
- 100-ft buffer
- wetland swale

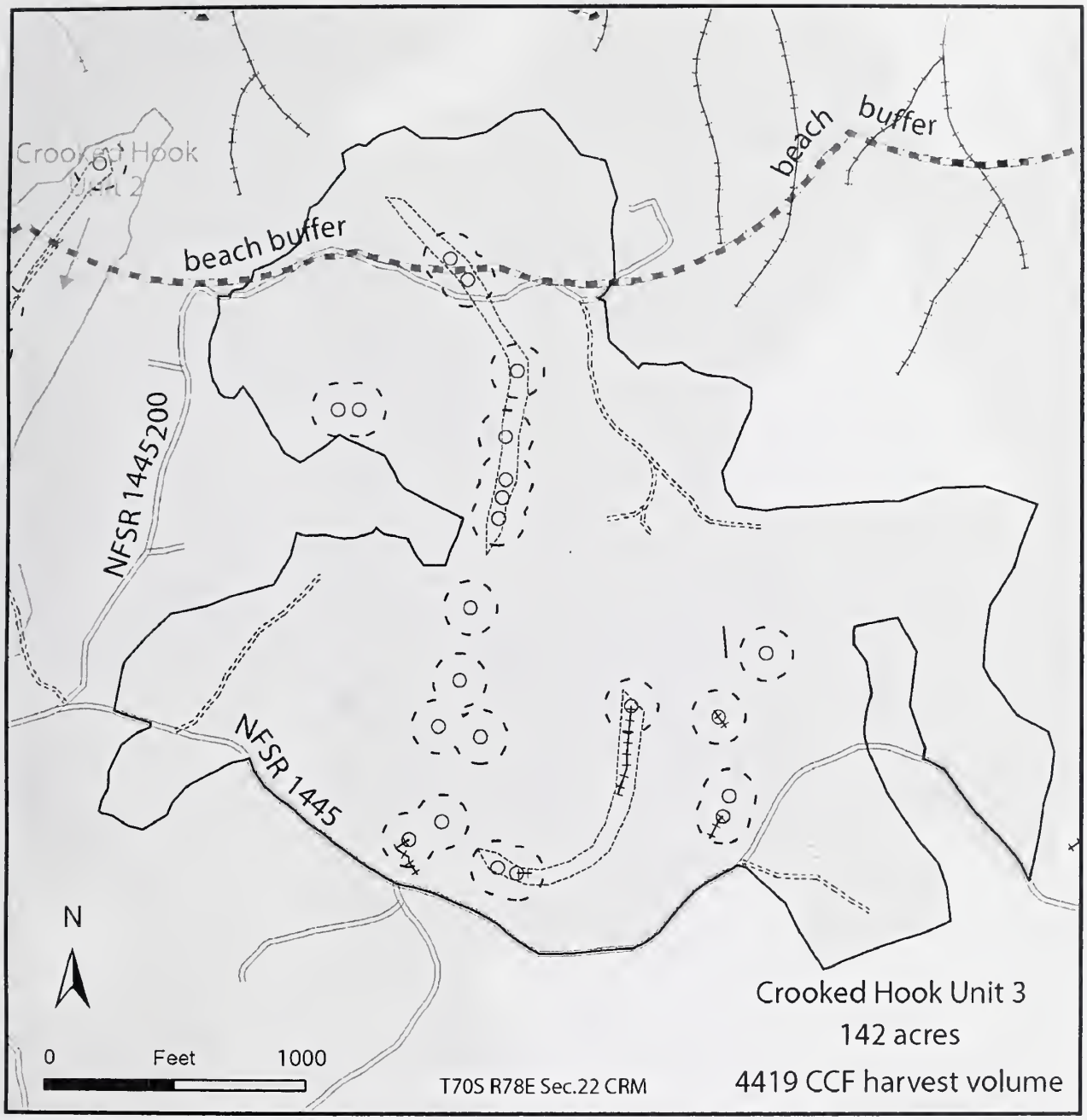
- proposed unit
- past harvest
- State land

- existing road
- proposed road
- 1000-ft beach bufffer

Map 2-2 Crooked Hook Unit 2



Map 2-3 Crooked Hook Unit 3



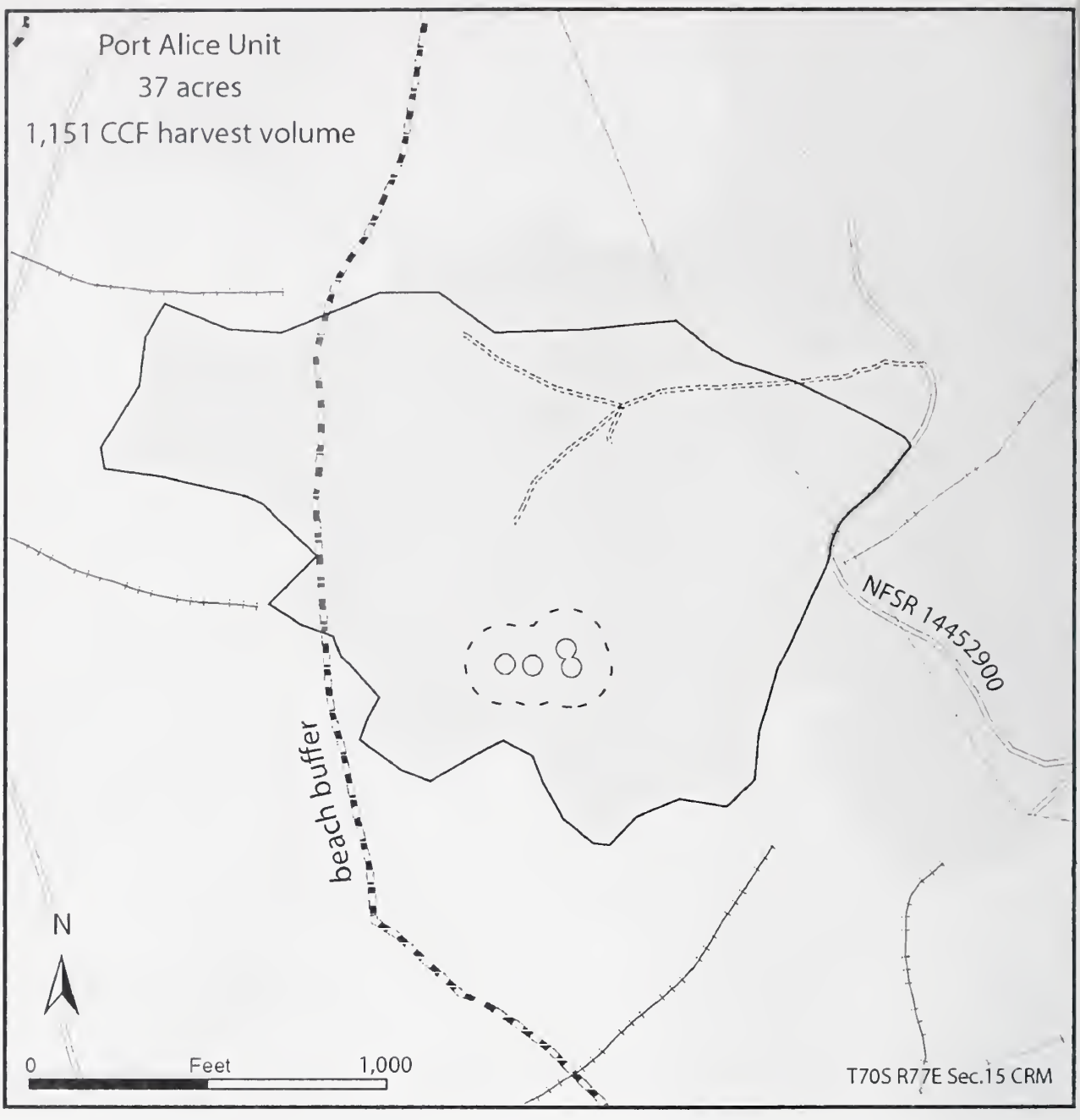
Streams
- Class I
- Class II
- Class III
- Class IV

Karst
- 25-ft buffer
- 100-ft buffer
- wetland swale

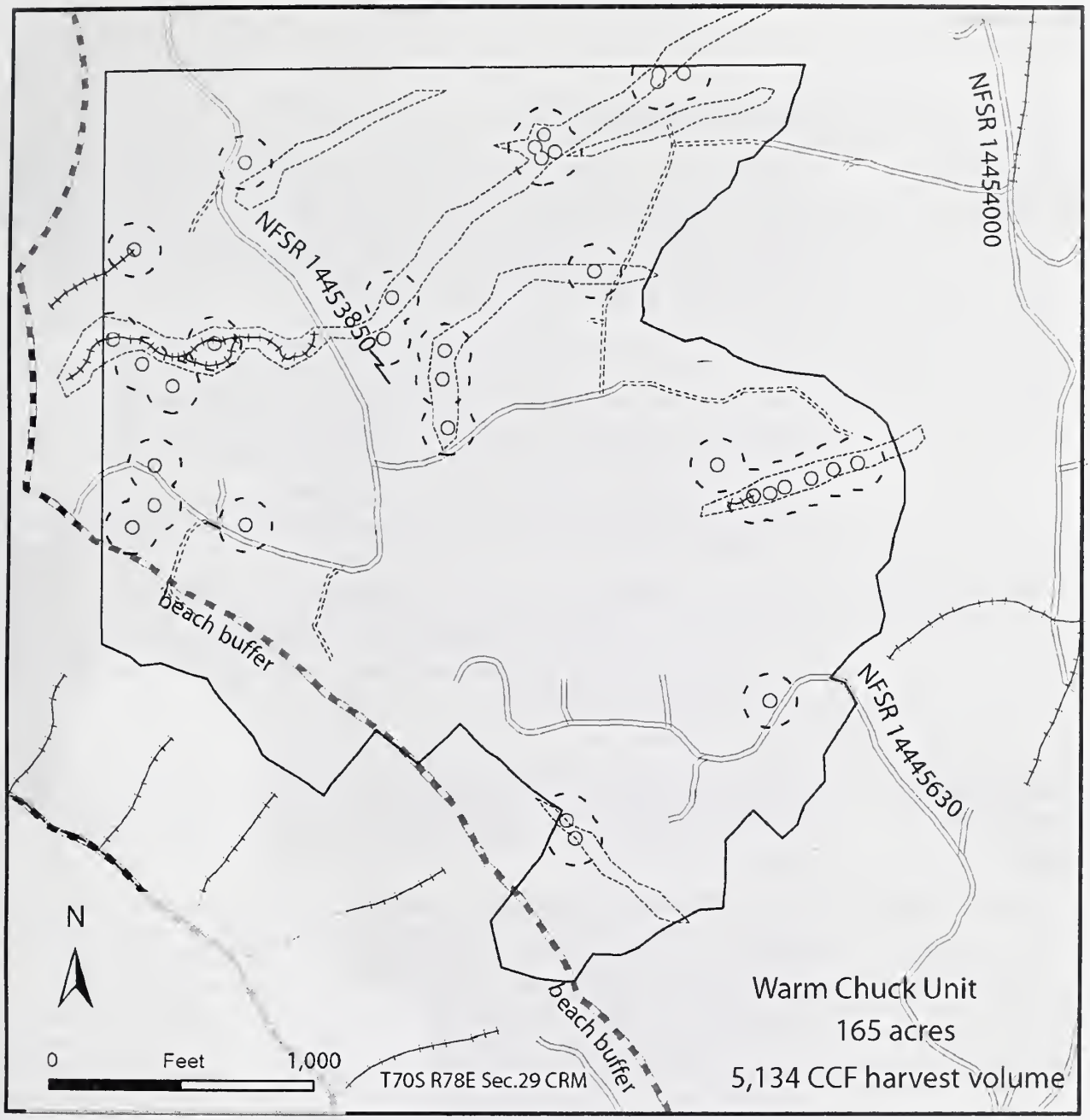
- proposed unit
- past harvest
- State land

- existing road
- proposed road
- 1000-ft beach bufffer

Map 2-4 Port Alice Unit



Map 2-5 Warm Chuck Unit



Streams
- Class I
- Class II
- Class III
- Class IV

Karst
- 25-ft buffer
- 100-ft buffer
- wetland swale

- proposed unit
- past harvest
- State land

- existing road
- proposed road
- 1000-ft beach bufffer

ALTERNATIVES

Alternative 1 No Action

There would not be commercial thinning, road reconstruction or construction, or Forestry Sciences Laboratory research study plots with Alternative 1. The Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14d) require that a "no action" alternative be analyzed in every environmental analysis. This alternative represents the existing condition against which the other alternative is compared. Timber harvest on State lands would still take place.

This alternative would not alter existing conditions in the stands. The five units would likely remain in the stem exclusion stage for another 50 to 100 years. Stands would remain overstocked and would be delayed in reaching the understory re-initiation stage. Therefore, some timber would be lost to mortality and decay. There would also be little improvement to tree growth and wood quality.

Abundance and diversity in the understory would remain at very low levels and canopy closure would not be altered. Therefore, the low quality of wildlife habitat would remain unaltered.

The proposed bridge and culvert replacements would not be accomplished.

There would be no additional jobs created or income generated.

The opportunity to benefit future second-growth management with knowledge gained through this project would be lost.

Alternative 2 Proposed Action

Alternative 2 proposes to commercially thin about 13,000 CCF in five older second-growth units on 400 acres of the 18,665-acre project area. The units were originally harvested between 50- and 70-years ago and are densely stocked with western hemlock and Sitka spruce.

The FSL study plan estimates 25 to 50 percent of the volume would be removed using various treatments. Types of commercial thinning treatments may include strip thinning and various density thinnings. Strip thinning is done in alternating strips where trees are completely cut in one strip and untouched in the next. Density thinnings are accomplished by targeting a desired number of tree species and trees per acre to be retained. Tree retention is usually based on a fixed or variable spacing. An example of a fixed spacing would be spacing on a grid, where a tree is left every 20 feet (20 foot by 20 foot spacing). An example of variable spacing would be where the spacing is dependent on tree diameter and density.

The original timber harvest extended into the 1000-foot beach fringe in all units. This left overcrowded, closed canopy conditions in the beach fringe. Alternative 2 would thin 34 acres of beach fringe in the units; five acres in Port Alice, nine acres in Warm Chuck, three acres in Crooked Hook 1, four acres in Crooked Hook 2, and thirteen acres in Crooked Hook 3. Control blocks of unthinned trees would also be necessary for the FSL study in order to compare the affects of the treated areas with untreated areas. As a result, not every acre of every unit would be thinned.

Because of the possible compaction and soil disturbance associated with ground-based systems on thinner soils, a cable logging system would be used for this project.

Cable systems are best suited for areas with soil concerns and slopes greater than 40 percent. The advantage of cable systems is their ability to suspend logs over the ground to minimize soil disturbance.

There are 80 miles of existing Forest road and 6 miles of State road in the project area. The project would require 2.6 miles of new road construction, 4.5 miles of road reconstruction, and 12 miles of road maintenance. There would be about 2.9 miles per square mile of road density. There are 47 stream crossings in the project area (26 stream crossings along the proposed haul route.) The new road construction would not require additional stream crossings. A log bridge and four culverts on the haul route that block fish passage would be replaced. Three additional culverts would be put on the deferred road maintenance schedule to be replaced when funding allows.

Some work on the Port Alice LTF would be necessary under Alternative 2. It would require basic grading of the site to ensure proper drainage and to alleviate any sediment concerns associated with operations.

Karst features are found in the five units. Due to past harvest, canopy closure exceeds historic levels found in the old-growth forest. Alternative 2 would thin in low, moderate and high vulnerability karst areas to help return the forest canopy to historic old-growth levels. "No-harvest" 25-foot buffers would be implemented around high vulnerability karst features rather than the usual 100-foot buffers in order to reduce stand density and open the forest canopy.

Twenty-seven acres of high vulnerability karst would be thinned. All harvested timber would be directionally felled from the slope break of karst features and split yarded from the features. Any material landing on the slope break of a feature or within a feature would be hand removed. No yarding across, through, or beside features or related streams would be allowed. Logs would not be skidded adjacent to or within features or streams.

ALTERNATIVES ELIMINATED FROM FURTHER STUDY

The IDT considered other alternatives that were eliminated from further analysis. The IDT discussed adding a third alternative that would commercially thin about 331 acres in the same five second-growth units. It would have eliminated thinning in the 1000-foot beach fringe (34 acres) and high vulnerability karst features (27 acres). The closed canopy in these areas would have remained. The IDT thought eliminating all of the beach fringe and high vulnerability karst would not allow these overstocked areas to be improved and would not generate information for improving future management. The decision-maker could choose to eliminate any portion of thinning in the beach fringe or in karst areas in Alternative 2. Therefore, it seemed redundant to offer a third alternative that could be addressed through Alternative 2. This alternative would not change the miles of new road construction and road reconstruction, or the number of stream crossings in Alternative 2.

There were no public comments that generated a need to develop other alternatives to address public concerns (NEPA, 102(E), 40 CFR 1501.7). Alternative 2 allows the Decision Maker flexibility to determine the location and extent of thinning activities. For these reasons the IDT determined that one action alternative and the no action alternative constituted a reasonable range of alternatives.

ALTERNATIVE COMPARISONS

The alternatives were analyzed for direct, indirect, and cumulative effects. This analysis included National Forest System lands, as well as adjoining State lands. Table 2-1 summarizes the effects of implementing the alternatives by key indicators. Resource specialists developed key indicators as a means to measure the effects of alternatives on resources. The values for the key indicators are listed in the following table. None of the indicators identified significant impacts to the resources.

Table 2-1 Summary of the effects of alternatives by key indicators for resources

Effects Indicator	Alt. 1	Alt. 2
Fisheries		
"Red" culverts needing fish passage improvements after implementing the alternative. (Three additional culverts would be put on the deferred road maintenance schedule for repair as funding allows.)	15	13
Geology, Minerals, and Karst		
Acres of high vulnerability karst in the units	0	42
Acres of high vulnerability karst thinned	0	27
Acres of moderate vulnerability karst in the units	0	148
Acres of low vulnerability karst in the units	0	210
Hydrology		
Miles of Class IV streams affected by thinning	0	0.6
Acres of proposed thinning	0	400.0
Acres of high vulnerability karst thinned	0	27.0
Miles of new road construction	0	2.6
Miles of road reconstruction	0	4.5
Silviculture		
Average value of trees by physiological characteristics	medium	high
Herb and shrub ground cover on 90% of the area	0-25%	66-85%
Weather damage	20 acres	30 acres
Acres of stem-exclusion stands on Heceta Island by 2014	8,739	8,339
Soils		
Total acres of soil disturbance	0	43.6
Percent of soil disturbance in thinning units	0	10.9
Percent of soil disturbance in project area	0	0.2
Percent of detrimental soil condition in thinning units based on Region 10 standards and guidelines	0	5.0
Percent of detrimental soil condition in project area based on Region 10 standards and guidelines	0	0.1
Timber		
Value of the Knowledge Gained for Future Second Growth Management	None	High Value
Number and size of thinning units		
Number of commercial thinning units	0	5
Acres in the units	0	400

Effects Indicator	Alt. 1	Alt. 2
Estimated volumes CCF (hundred cubic feet) in the thinning units		
CCF before thinning	24,894	24,894
CCF retained after thinning	24,894	12,447
Log Grades and Product Quality		
Present	Grades 2 & 3 Low to Moderate Quality _	Grades 2 & 3 Low to Moderate Quality
Future	Grades 2 & 3 Low to Moderate Quality	Grades 0,1,2,3 Wide Range of Quality
Supply of second growth available to the market		
Present	None	Low
Future	None	High
Demand for Second-Growth		
Present	Low	Low
Future	Low	High
Timber Sale Economics (in dollars)		
Anticipated Timber Sale Bid Value (dollars)	0.00	$-1,635,440.47
Total Project Costs	-255,158.40	$ -628,560.93
Socio-Economics		
Direct Jobs	0	33
Direct Income from Jobs	0.00	$1,463,624.40
Transportation		
Miles of New Road Construction	0.0	2.6
Miles of road reconstruction and maintenance	0.0	16.5
Total Miles of Road in the Project Area	86.0	88.6
Wildlife		
Small mammal population (populations depend on plant biomass)	Low	Would increase
Understory plant biomass (biomass dependent on available sunlight)	Low	Would increase

SUMMARY OF EFFECTS

Cumulative Effects, Unavoidable Adverse, Short-term Use, Long-term Productivity, Irreversible and Irretrievable Commitments

Analyzing Effects - Environmental consequences are the effects of implementing an alternative on the physical, biological, social and economic environment. The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) include a number of specific categories to use for the analysis of environmental consequences. Several categories of effects are applicable to the analysis of the proposed project and form the basis of much of the

analysis that is summarized in Chapter 3. The direct environmental effects occur at the same time and place as the initial cause or action. Indirect effects of the project occur later in time or are spatially removed from the activity, but would be important in the foreseeable future. The analysis of these effects is described for each resource in Chapter 3.

Cumulative Effects

Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes such actions. Cumulative effects can result from individually minor, but collectively important actions that take place over a period of time.

Alternative 1 is the "no action" alternative. Thinning would not take place and stand conditions would remain as they are. The stands in the proposed units would eventually assume a more open canopy similar to pre-harvest conditions as trees succumb to insects, disease, and windthrow. This process could take 50 to 100 years. Meanwhile, there would be a lack of understory growth to provide wildlife habitat.

Culverts allowing fish passage along the road system would continue to be blocked by beaver dams and would be periodically cleaned of debris. Culverts that are perched too high for fish passage would not be replaced.

Some road maintenance and reconstruction work was done in connection with the Heceta-Sawfly sale, completed in May 2001. Two areas received shot rock borrow placement necessary for haul on FS 1445000. Seven culverts were cleared of debris in 2002.

Sedimentation would continue at the same rate. Karst features would continue to collect sediment and debris.

Recreation carrying capacity associated with hunting, fishing and hiking would not change from current levels under either alternative.

Alternative 2 would commercially thin 25 to 50 percent of second growth in five thinning units totaling about 400 acres. The proposed action would construct 2.6 miles of new road and improve 16.5 miles of existing road. (see Chapter 3 transportation)

Many sinkholes are seasonally ponded with surface water. Careful thinning would hasten the hydrologic recovery of these areas and would return the stands to a closer-to-pre-harvest tree spacing, canopy closure and canopy interception (Chapter 3 karst)

The proposed thinning would have minimal if any negative cumulative effects to the fish resources in the project area. There are no stream crossings associated with the 2.6 miles of new road construction. Four of the five units contain Class IV streams; which do not generally have stream buffers. However, to minimize sedimentation, trees would be felled and split yarded away from these streams. Any slash falling into streams would be removed to minimize the amount of sediment entering the streams and karst systems that might impact fish resources downstream.

Thinning would shorten the timeframe for these stands to regain mature old growth visual characteristics as viewed from the Priority Use Areas. Additional effects could

occur from future harvest on State-owned lands along Sea Otter Sound (see Chapter 3 scenery).

The proposed action would move existing stands from the stem exclusion stage to the understory re-initiation stage of stand development. There would be several benefits.

1. Improving the health and vigor of the stands by allowing more growing space per tree, and removing diseased and suppressed trees.
2. Capturing wood production from mortality and transferring growth loss from many small stems to fewer large stems.
3. Developing a more diverse understory of tree, brush, and forbs for wildlife.

The 33 timber jobs created by this project would benefit forest workers in the Prince of Wales Island and Ketchikan areas (see Chapter 3 timber).

The 2.6 miles of new road would be left open for project monitoring after harvest activities. This would result in a minor increase in road maintenance in the form of grading on an as-needed basis.

The construction of 23.6 acres of roads and rock pits would add to the existing erosion sources present in the project area. The proposed thinning would cause minimal surface erosion. Roads in the project area would continue contributing minimal amounts of sediment to streams (see Chapter 3 transportation and soils).

The proposed action would benefit wetland hydrology as the forest canopy returned closer to pre-harvest condition. The thinned forest canopy would also return soil moisture characteristics to that of pre-harvest condition. The thinning effects on wetlands would improve the overall condition of about 586 acres of wetland that were previously harvested in the project area (see Chapter 3 hydrology and wetlands)

The project would result in long-term improvements in the habitats for most wildlife species by re-establishing a multi-layer canopy and forest openings. There would be an increase in the biomass present in the units, the prey densities, and the number of snags. An increase in the available biomass would show a net positive effect on deer and wolf populations. An increase in prey would be beneficial to both goshawk and marten. The presence of more snags would have a positive impact on several cavity nesting bird species and provide more suitable denning sites for marten. The road density would increase by .01 mi/mi^2. This increase in road density is not significant and should not increase the hunting pressure on deer and wolves (see Chapter 3 wildlife).

Other Activities Scheduled for Heceta Island

State of Alaska Proposed Projects

The Alaska State Division of Forestry (DOF) 5-year schedule includes harvest in the Camp Cove area and a commercial thinning south of Camp Cove between 2003 and 2007. The 3.12 MMBF harvest of second growth in Camp Cove is estimated to cover 120 acres. The harvest would occur on one unit and would require the construction of 1.2 miles of road. Another unit of commercial thinning second growth would cover approximately 109 acres and would be a 1.0 MMBF sale. The commercial thinning project would use existing Forest Service roads.

Soil disturbances and sedimentation caused by the State projects would add to the cumulative effects in the project area. Because the State of Alaska proposed timber sales are also in second growth, there would be beneficial effects of reducing the density of trees and encouraging hydrologic recovery. The construction of 1.2 miles of road on State land would increase the road density and could induce sedimentation for a short period of time (less than 1 year).

Butterball EIS

Butterball EIS is listed for 2010 on the Tongass ten-year sale plan. Preliminary information projects a 10 MBF timber sale on about 2,100 acres of suitable and available Forest land. Design elements of the proposed project, such as project area and unit boundaries, are not finalized. The proposed Butterball EIS project will be fully analyzed in an environmental impact statement. The analysis will consider the Heceta Commercial Thinning Study EA and other agency activities as well as other ecological changes to the environment that might occur between now and when the project analyses begin.

Precommercial Thinning

The precommercial thinning program on the Thorne Bay Ranger District has treated about 2,057 acres of young second-growth stands on Heceta Island. Average age of the stands was about 24-years-old when treated.

Future precommercial thinning is scheduled to take place between 2004 and 2006 on Heceta Island. One 70-acre thinning area is located on the northwest portion of the island, west of Port Alice inlet. The area cannot be seen from the inlet or from the project area. A second area scheduled for precommercial thinning is 1,208 acres on the southwest part of the island. There would be no significant effects to the proposed project from precommercial thinning.

Unavoidable adverse effects can result from any action alternative where the effects cannot be effectively mitigated or avoided. Many adverse effects can be reduced, mitigated or avoided by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific thinning units and roads was designed to eliminate or lessen the significant adverse consequences. The application of Forest Plan standards and guidelines, Best Management Practices, project-specific mitigation measures, and monitoring are all intended to further limit the extent, severity, and duration of potential effects. Such measures are discussed throughout Chapter 3. Regardless of the use of these measures, some adverse effects may occur. The purpose of this environmental assessment is to fully disclose these effects.

There would not be unavoidable adverse effects to the resources. Windthrow occurs naturally in the proposed harvest area. Although thinning could increase windthrow, silvicultural prescriptions would contain mitigations to minimize the effects of windthrow.

Short-term use and long-term productivity describe effects of short-term uses, and the effects; which occur annually or within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained-Yield Act, and the National Forest

Management Act, all renewable resources are to be managed so that they are available for future generations.

The harvest and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established again if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the resource protection measures (mitigations) described in this chapter, in particular those applying to the soil and water resources.

The temporary introduction of sediments during the replacement of four culverts and a log bridge would have minor effects to fish resources when compared the benefits of enhancing fish passage. Fish populations would benefit through increased genetic diversity, increased range, and increased habitat.

Careful thinning in these stands would enhance the long-term productivity of the karst lands. Thinning would hasten the hydrologic recovery and return the stand to a closer-to-pre-harvest tree spacing, canopy closure and canopy interception.

The proposed thinning would benefit the long-term productivity of the stands by promoting development of the understory and more closely reflecting the pre-harvest vegetation density.

Short-term uses involving commercial thinning and road construction activities would lead to surface disturbances. The majority of soil resources in the project area are protected from surface erosion by an organic mat. The proposed action could expose mineral soils and lead to short-term surface soil erosion losses. Less than two acres of wetland would be affected by road construction and incur long-term productivity losses.

There should be a flush in the understory productivity as a result of the proposed thinning; which would improve wildlife habitat. Over the long-term (150 years or more), understory productivity is estimated to be similar under either alternative.

Irreversible and irretrievable commitments describe a loss of future options. Irreversible applies primarily to the effects of use of nonrenewable resources such as mineral extraction or destruction of a cultural resource site. Once these resources are gone, they cannot be replaced. Irreversible can also apply to factors such as soil productivity that are renewable only over long periods of time.

Irretrievable commitments apply to the loss of production, harvest or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible because it would be possible to resume timber production if the land use changed.

The use of these terms to include in discussions of environmental consequences is found in 40 CFR 1502.16. The definitions above are found in the Forest Service Handbook (FSH 1909.15, 05).

The 2.6 miles of new road construction would be considered an irretrievable commitment because roads would remain open for monitoring purposes and because of the time that would pass before vegetation was re-established. The loss of vegetation and compaction of soils during road construction extends the length of time needed for roaded areas to recover to natural conditions.

Long-term soil productivity loss would be expected for road and rock pit construction where soil materials were permanently displaced. Under Alternative 2, a total of 23.6 acres of soil productivity would be lost to road and rock pit development.

Timbered land taken permanently out of production resulting from rock pit development would be an irreversible commitment associated with the timber resource on this project. Timbered land covered by new roadbed would be an irretrievable commitment associated with the timber resource on this project.

Wetlands displaced by road building and reconstruction activities (less than 2 acres) are irretrievable commitments of the project.

PROJECT-SPECIFIC MITIGATIONS

The analysis documented in this environmental assessment discloses the possible adverse effects that may occur from implementing the actions proposed. Measures have been formulated to mitigate or reduce these impacts. Each resource specialist describes resource concerns and the mitigations they recommend to reduce or eliminate adverse effects. The mitigations for each resource are listed below. Resource concerns and mitigation measures could be refined further during final layout. Forest Plan standards and guidelines and Best Management Practices (BMPs) used to meet the requirements of the Clean Water Act also apply to this project.

Essential Fish Habitat

The BMPs would be implemented during timber management, road reconstruction and construction, identification of Riparian Management Area (RMAs), and fisheries habitat management. These BMPs would provide assurance of water quality and aquatic habitat protection for all freshwater streams and EFH affected by the project. The USFS Region 10, Forest Service Handbook (FSH) 2509.22 outlines the BMPs to be included in the mitigation and protection of stream resources and EFH. They include, but are not limited to: 14.4 Location, Permitting, and Design of Log Transfer Facilities: 14.5 Road and Trail Erosion Control Plan: Timing Restrictions for Construction Activities; 14.8 Measures to Minimize Surface Erosion; 14.9 Drainage Control to Minimize Erosion and Sedimentation; 14.12 Control of Excavation land Sidecast Material; 14.14 Control of In-Channel Operations; 14.17 Bridge and Culvert Design and Installation; 14.18 Development and Rehabilitation of Gravel Sources and Quarries; 14.19 Disposal of Construction Slash and Stumps; 14.20 Road Maintenance; 14.26 Daily LTF Cleanup; 14.27 Log Storage/Sort Yard Erosion Control.

1. Proposed new roads and stream crossings across Class I, II and III streams would be constructed according to Forest Plan standards and guidelines. (There are no new stream crossings in the proposed project.)

   Maintain fish passage through stream crossing structures

   Consult with Alaska Department of Natural Resources (ADNR)

   Abide by the fish instream timing windows, indicating when stream work can be done, adherence to Alaska State Statute Title 41 (formerly Title 16)

Refer to the Tongass National Forest Land and Resource Management plan, 1997, Fish Standards and Guides for complete wording.

2. Reconstruction of existing stream crossings at Class I streams would result in a net benefit to EFH and anadramous species. Reconstruction would occur according to the Forest Plan standards and guidelines listed above.
3. Reconstruction and maintenance of the LTF at Port Alice would comply with the Corps of Engineers permit, EPA General Permit, and ADNR Easement Grant.
4. Reconstruction and maintenance of the Camp Cove (Four Mile) LTF would comply with USDA Forest Service standards and guidelines, BMPs, and all applicable permits.

Hydrology

1. Thinning would be directionally felled away from, and split yarded around, Class IV streams identified in the project area. Streams would be cleaned of any slash or organic material that results from project activity.
2. Seed all soil disturbances in harvest areas and along road corridor to limit erosion and sedimentation.
3. Recommend roads be designed with minimal excavation where possible and limit the extent of ditching in order to maintain natural infiltration and drainage pathways.
4. Road design would avoid karst features and karst buffers. Roads would be designed for drainage away from karst features where possible and would mitigate with erosion control methods around surface waters.

Karst

1. Use the karst resource assessment to plan timber harvest on the karst lands in the project area. Use Forest Plan standards and guidelines, best management practices, and site-specific mitigation to minimize adverse effects to karst.
2. All harvested timber would be directionally felled from the slope break of karst features and split yarded from the features. Any material landing on the slope break of a feature or within a feature would be hand removed. No yarding across, through, or beside a feature or associated stream would be allowed. Logs would not be skidded adjacent to or within features or streams.
3. Sinkholes in the proposed units would be buffered from their center to just outside the lip of the sink (about 25 feet). Small valleys and closed sinks would receive directional felling and split yarding away from their designated buffers. Karst depressions would be cleaned of any slash or organic material that results from project activity.
4. Following Forest Plan standards and guidelines, sinking streams and the features into which they flow would normally be excluded from harvest. A 100-foot no-harvest buffer would be placed on these areas. All such streams are outside the harvest unit boundaries. Shovel yarding would not be used on short, steep slopes, and rock outcrops, and areas of shallow soil atop epikarst.
5. Roads would be designed to avoid high-vulnerability karst.

6. The purchaser, sale administrator, and Forest geologist would review each prescription within each treatment block in the field before harvest commences.

Scenery

1. Mitigation measures would be implemented after thinning treatment if treatment exceeds a unit's VQO. Mitigations for the Old-growth Habitat LUD would include concealing visually disturbed areas with slash or other natural vegetation. Revegetation would also be implemented in units seen from Visual Priority Areas.

Silviculture

1. Silvicultural prescriptions would address concerns for short-term windthrow risk by adjusting thinning intensity where wind damage potential is high. Some sections, such as the southeast edges of the units would be strategically left untreated to act as a windbreak to buffer trees within the thinned sections.

Transportation

1. Continuance of the BMPs and mandated annual re-inspection of 25 percent of the roads recorded on the road condition surveys (RCS) would continue. This includes documenting the corrections and entering other problems that have developed since the last inspection. A rating system exists to prioritize any necessary actions to correct problems with the road systems as they occur.
2. Schedule instream work around fish instream timing windows, indicating when stream work can be done, in adherence to Alaska State Statute Title 41 (formerly Title 16). A concurrence can be requested from Alaska Department of Natural Resources when instream work is required outside of the appropriate timing windows.

Wildlife

1. Any nest or den sites discovered at any time during the project will be protected by current Forest Plan standards and guidelines.

Other mitigations

The following items are key Forest Plan standards and guidelines that would apply to Alternative 2.

Biodiversity and Old-growth Habitat: Comply with the Forest Plan conservation biology strategy designed to ensure well-distributed, viable populations of wildlife (see Chapter 3 wildlife).

Heritage Resources: The Forest Plan standards and guidelines for heritage resources (p 4-15) state that avoidance and protection is the preferred management of sites listed in, nominated to, or eligible for the National Register of Historic Places. Evaluation of the data collection needs and survey strategy is described in the Memorandum of Understanding between the Forest Service Alaska Region, Alaska State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP). This agreement modifies the standard procedures described in Section 106 of the National Historic Preservation Act of 1966. The possibility that significant historic properties exist in the "Area of Potential Effects" for this project

is very low because no activities are planned in the high sensitivity 100-foot beach fringe buffer. Following harvest, a sample of roads and units would be monitored to test the assumptions of the sensitivity model (see Chapter 3 heritage).

Subsistence: The alternatives have been evaluated for compliance with the Alaska National Interest Lands Conservation Act (ANILCA), Title VIII, Section 810 (see Chapter 3 wildlife).

MONITORING

The National Forest Management Act requires that National Forests monitor and evaluate their forest plans (36 CFR 219.11). Chapter 6 of the Forest Plan includes the monitoring and evaluation activities to be conducted as part of Forest Plan implementation. Implementation monitoring is used to determine if the goals, objectives, standards and guidelines, and practices of the Forest Plan are implemented.

Project-specific Monitoring

Hydrology - Karst and stream buffers would be monitored for windthrow one and five years following harvest. Monitoring would include field reconnaissance to determine the stability and effectiveness of the buffers.

Karst - Monitor the karst thinning sites located outside of the FSL study plots to see if the objectives were met. A minimum of three sites would be picked in each treatment area and control block, watching for changes in flows, piping, settling, and sedimentation. The larger streams would be dye traced to their springs on the coast, so any changes can be noted. The effectiveness of the prescribed buffers and yarding and felling restrictions would also be monitored. It is recognized that these are high vulnerability karst lands and they will be mapped and managed as such in further timber management considerations.

In collaboration with the USDA Forest Science Laboratory, the Forest would test different options to assess which meet the project objectives. During this collaborative effort, the vegetative response to commercial thinning operations and the effects on wildlife habitat would be monitored. By monitoring vegetative response, habitat variables important to deer during winter would be assessed. Additionally, the Forest Service would index small mammal abundance.

Scenery - Monitoring would occur immediately after treatment in order to determine if mitigation measure should be implemented. Monitoring should take place about every 10 years after the initial treatment to observe how fast these areas visually return to old-growth characteristics compared to other stands that are not being thinned.

Silviculture - Monitoring would occur as part of the scientific study to be conducted by the FSL.

Transportation - The log transfer facilities have monitoring procedures as outlined in Forest Plan 4-109 Appendix G-1.

Wildlife - Inventories of small mammal populations in the proposed commercial thinning stands and in old-growth stands were conducted in 2000 and 2001.

Transects were established with Museum Specials and rattraps were used in each stand type. Specimens were sent to the University of Alaska Museum for assessment. Relative abundance of small mammals by species was calculated by stand type.

Other Monitoring

Wetlands - A monitoring plan for the Tongass National Forest is described in the Forest Plan. In a 1992 Memorandum of Agreement between the Alaska Department of Environmental Conservation and the USDA-Forest Service Alaska Region, the Forest Service performs annual BMP implementation and effectiveness monitoring. The project area would be part of the Forest Plan monitoring.

Routine implementation monitoring assesses whether the project was implemented as designed and whether or not it complies with the Forest Plan. Planning for routine implementation monitoring began with the preliminary design of thinning units and roads. The mitigations and unit silvicultural prescriptions are the basis for determining whether recommendations were implemented for the project.

Routine implementation monitoring is also part of the administration of a timber sale contract. The sale administrators and road inspectors ensure that the unit silvicultural prescriptions are incorporated into contract documents; they then monitor performance relative to contract requirements. Input by resource staff specialists, such as fisheries biologists, soil scientists, hydrologists and engineers is requested as necessary during this implementation monitoring process. The specialists provide technical advice when questions arise during project implementation.

Tongass National Forest staff annually conducts a review of BMP implementation and effectiveness. The results of this and other monitoring are summarized in an annual monitoring and evaluation report. This report provides information about how well the management direction of the Forest is being carried out, and measures the accomplishment of anticipated outputs, activities and effects.

Fisheries Monitoring - Roads, stream crossings, and fish passage are monitored on a rotational basis and documented in the road condition survey (RCS) database.

Chapter 3

Environmental Effects of the Project

INTRODUCTION

The resource discussions in Chapter 3 are arranged alphabetically. This chapter is a summary of resource reports on the affected environment and the environmental consequences of each alternative. It also presents the scientific and analytical basis for the alternative comparisons presented in Chapter 2. Direct and indirect and effects are described here. See Chapter 2 for a summary of the cumulative, unavoidable adverse, short-term use and long-term productivity, and irreversible and irretrievable effects. Effects are quantified where possible, and qualitative discussions are included. Mitigations for potential adverse effects are summarized in Chapter 2.

Much of the Tongass National Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in the analyses of these data. GIS data is available in tabular (numerical) format, and as plots displaying data in map format. For this EA, all maps and most of the numerical analyses are based on GIS resource data; which has been updated based on field inventories.

The following table lists some of the basic data used for analysis by the various resource specialists. The information is listed here for the reader's convenience and in order to reduce repetition in each resource section that follows.

Table 3-1 Partial list of data used by resource specialists for the project analysis

ACRES	
Project area total acres	**18,665.0**
National Forest Land	15.396.0
Old-growth Reserve land use designation (LUD) = 2118.0	
Timber Management (TM) LUD = 13278.0	
State Land	3.249.0
SeaAlaska Land	10.0
Other ownership	10.0
Acres Past harvest in project area (29.2 mi/mi^2) (50% of area)	**9,411.0**
Total acres in units (2% of project area)	**400.0**
Acres Old-growth Reserve LUD Port Alice unit	35.0
Acres Timber Management (TM) LUD Port Alice unit	2.0
Total acres Port Alice unit (TM LUD)	37.0
Acres Warm Chuck unit (TM LUD)	165.0
Acres Crooked Hook 1 (TM LUD)	26.0
Acres Crooked Hook 2 (TM LUD)	30.0
Acres Crooked Hook 3 (TM LUD)	142.0
Total acres State timber sale plans 2003-2004 (4.12 MMBF)	**229.0**
Acres Camp Cove Sale 3.12 MMBF	120.0
Acres Heceta CT Sale 1.0 MMBF	109.0
MILES OF ROAD	
Miles of new road construction	**2.6**
Total miles of reconstruction and maintenance (haul route)	**16.5**
miles of reconstruction	4.5
miles of maintenance	12.0
Miles of road in project area	**86.0**
system roads	56.0
temporary roads	30.0
Miles per square mile of road under Alternative 1 (rounded to 2.9)	2.86
Miles per square mile of road under Alternative 2 (rounded to 2.9)	2.87
STREAMS	
Miles of stream in project area	**81.2**
Class I	36.8
Class II	22.4
Class III	21.2
Class IV	0.8
Miles of Class IV streams in units (NO Class I-III in the units)	0.6
Number of Class IV streams in the units	17
Number of stream crossings in project area	47
Number of stream crossings on haul route	26

FISHERIES

This section describes the existing aquatic and fisheries resources in the project area, with focus on fisheries resources. Applicable fisheries and riparian direction is contained in the Forest Plan FEIS, Chapter 4 (Forest-wide standards and guidelines and Appendices D and J.)

The key indicator for measuring the effects of the alternatives on fisheries is the number of culverts or structures that inhibit fish passage.

AFFECTED ENVIRONMENT

The proposed thinning project would not affect fisheries resources within the units because there are no streams with known fish populations or fish habitat in the units. The existing road system has the potential to affect the fisheries resources in the project area. Maintaining fish passage through culverts is the primary concern for fisheries resources.

There are 17 Class IV streams (see stream definitions next page) located in the units. The project area consists of about 86 miles of existing road, 47 stream crossings, and 81.2 miles of stream. Of the 47 stream crossings, 15 are marked because they inhibit fish passage. These markers are known as "red culverts". Five red culverts are located along the haul route of the proposed project. The most common inhibitors to fish passage are vertical barriers, debris blockages, and excessive water velocities (USDA 2002).

Harvest and road construction occurred before the 1997 Forest Plan and provided little or no protection for fisheries resources. Blocked fish passages can result in loss of genetic diversity, loss of range for juveniles, changes in genetics or community assemblages upstream of the crossing, and the loss of resident fish populations in small streams (*Aquatic Habitat Management Handbook (AHMU)*, 2001).

Fish and Fish Habitat Use

Anadromous species have complex life cycles. They spend adulthood in the ocean, but they use freshwater habitats for reproduction. Eggs are deposited in depressions dug into streambeds, and then they are covered with gravel for incubation. Juvenile coho salmon (*Oncorhynchus kisutch)*, Dolly Varden char (*Salveninus malma*), steelhead (anadromous rainbow) trout (*O. mykiss*) and cutthroat trout (*O. clarki clarki*) rear in freshwater for an extended period of time before migrating to sea. Sockeye salmon (*O. nerka*) rear in lakes for 1-2 years before migrating to seas. Pink (*O. gorbuscha*) and chum salmon (*O. keta*) fry migrate seaward soon after emerging from the gravel. Coho, chum, and pink salmon are primarily fall spawners, as are Dolly Varden char. Steelhead and coastal cutthroat trout are spring spawners.

Anadromous fish that spawn in freshwater streams or lakes in the project area include pink salmon, chum salmon, coho salmon, sockeye salmon, steelhead trout, sea-run coastal cutthroat trout, and Dolly Varden char. Chinook salmon (*O. tshawytscha*) has not been documented in project area streams or lakes. Resident freshwater game

species include resident coastal cutthroat trout and resident Dolly Varden char. Resident freshwater nongame species include sculpin (*Cottus* sp.) and three-spine stickleback (*Gasterosteus aculeatus*).

Stream Classes

Class I streams are defined by the *Aquatic Habitat Management Handbook* (AHMU) as streams and lakes with anadromous or adfluvial fish or fish habitat; or high quality resident fish waters, or habitat above fish migration barriers known to provide reasonable enhancement opportunity for anadromous fish (AHMU 2001 12:7-8). (Adfluvial fish migrate between freshwater lakes, streams, or rivers.)

Class II streams are defined by AHMU as streams and lakes with resident fish or fish habitat with generally steep (6 to 25 percent or higher) gradients where no anadramous fish occur, and otherwise not meeting Class I criteria.

Class II (non-direct) streams have resident fish or fish habitat. They flow directly into the ocean or join a Class I stream only at lower than mean high tide. They can also be a Class II tributary stream segment that flows into a Class III stream (at least 300 feet in mapped length) that in turn flows into a Class I stream.

Class III streams are defined by AHMU as perennial and intermittent streams that have no fish populations or fish habitat, but have sufficient flow or sediment and debris transport to directly influence downstream water quality of fish habitat capability.

Class IV streams are other intermittent, perennial, and ephemeral channels with insufficient flow or sediment transport capabilities to directly influence downstream water quality or fish habitat capability.

Non-streams are generally rills and other watercourses less than one foot wide with little to no incision.

The standards and guidelines for the protection of stream and riparian management areas are located in Chapter 4 of the Forest Plan (pp 4-53 to 4-73). Stream class definitions are found in chapter 10 of AHMU.

The project area contains 36.8 miles of Class I streams, 22.4 miles of Class II streams, and 22.0 combined miles of Class III and IV streams. The classifications of streams located in or adjacent to the units are shown in Table 3-2.

Fish Passage

Corrugated culverts are the most widely used fish passage structures on the Tongass National Forest. Current techniques such as maintaining natural streambed, stream simulation, fishway designs, and the "no slope" culvert design are used on the Tongass National Forest. The *Aquatic Habitat Management Handbook* (AHMU) provides guidelines for fish passage at culvert installations (AHMU 2001 34.2:22-31). These guidelines would be used in all road reconstruction proposed in this project.

Fish passage on pre-existing road did not always follow the aforementioned guidelines. This resulted in the inability of fish to pass through culverts due to vertical barriers, excessive water velocities, and debris blockages. Inhibiting fish

passage at various flows affects fish populations by decreasing range, losing genetic diversity, changing the genetics or community assemblages of the populations upstream from the crossing, and losing resident fish populations in small streams (AHMU 2001 34:20).

Best Management Practices

Best management practices (BMPs) are used to ensure compliance with the Clean Water Act and help protect riparian habitat on streams not protected by buffer zones. In order to minimize the potential for adverse impacts to soil and water resources by management activities, BMPs are used directly or indirectly to protect water quality from non-point source pollution. This is typically done through site-specific prescriptions. The Forest Plan (Appendix C) discusses BMPs.

Existing Streams

Based on field surveys, map, and aerial photograph interpretation 3,263 feet (0.6 miles) of Class IV streams are located in the units (Table 3-2). The unit boundaries of Crooked Hook 1 and 2 were moved to avoid two Class II streams that flow into karst insurgences. There are no Class I, Class II, or Class III streams in the units.

Table 3-2 Number of streams and stream length for each proposed unit

Note: There are no Class I, Class II, or Class III streams in the proposed project units.

Unit	Class IV streams (number - total length in feet)
Warm Chuck	3 streams - 1465 feet
Port Alice	0 streams - 0 feet
Crooked Hook #1	5 streams – 235 feet
Crooked Hook #2	4 streams - 804 feet
Crooked Hook #3	5 streams - 759 feet

Existing Stream Crossings

There are about 86 miles of existing roads in the project area, about 2.9 miles of road per square mile. The road system crosses 11 Class I, 11 Class II, 3 Class III, and 22 Class IV streams. Of the 22 Class I and II stream crossings, 15 are categorized as "red" culverts; which fail USDA Forest Service fish passage criteria, possibly inhibiting fish passage. Tables 3-4 and 3-5 display the five red culverts along the 16.5 miles of haul route that inhibit fish passage. Two of these red culverts are scheduled for replacement during the project and three would be listed on the deferred road maintenance schedule for replacement later, as funding allows.

Upstream habitat assessments are performed to determine the length and quality of habitat above the crossing. Upstream habitat assessments and site characteristics assist in determining the severity of fish passage problems. Additional analysis includes use of the FishXing analytical model. FishXing is a software developed by the USDA Forest Service to assist with the calculations needed to estimate the effects

on the fish's ability to move through the culvert at different stream flows (USDA 2002). Any structures that are identified as posing the highest risk to fish and water resources can then be scheduled into maintenance contracts or included for replacement in future projects. Seven culverts were cleaned of debris summer 2003. Two of these were "red" culverts and the cleaning effectively re-established fish passage.

State of Alaska Lands and Projects:

The State of Alaska, Department of Fish and Game operates a fish weir located on Chuck Creek, the outlet to Chuck Lake. The Warm Chuck drainage was extensively logged in past harvest. The fish weir site is located downstream from where 1445630 road crosses Chuck Creek. This road accesses the southeastern portion of the Warm Chuck unit and is on the haul route.

ENVIRONMENTAL CONSEQUENCES

Logging and associated road building can affect fisheries resources by changing the delivery of water, sediment levels, and amount of large woody debris entering the stream system. These changes can adversely affect the stream habitat for fish. The closer the timber harvest activities are to a stream, the higher the risk of adversely affecting fish habitat.

Table 3-3 Key indicator of effects of the alternatives on fisheries

Key Indicator	Alt. 1	Alt. 2
Number of "red" culverts needing fish passage improvements after the project is implemented	15	13 (Could be fewer if more culverts are corrected during the project)

The project units contain only Class IV streams. All streams within or adjacent to the thinning units, except for one Class IV stream adjacent to the Port Alice unit, flow either into or out of karst features.

Two Class II streams were identified in the project area. The unit boundaries were moved to avoid these two streams. Both streams contain areas that meet the criteria for fish habitat, but no fish populations were located in the systems. Both streams flow into karst insurgences and are heavily laden with sediment. The resurgence points are unknown. Therefore, the level of sediments that might be present when the streams resurface is unknown. Both streams have 100-foot buffers because of the potential to funnel sediment-laden waters into karst sinks and potentially affect fish habitat at the resurgence.

Alternative 1

The "no action" alternative proposes no road construction, road reconstruction, culvert replacement, or harvest activities in the project area. The miles of road and road density would not change. This alternative proposes no new stream crossings in the project area. It does, however, fail to correct the existing fish passage problems at "red" culverts in the project area.

Over time, weathering and degrading roads coupled with effects of beaver activity would plug culverts; which would block fish passage and cause runoff. Weather effects and road failures could increase the introduction of sediment, and re-route sediment laden water into streams. Sedimentation of streams would adversely affect fish resources.

Alternative 2

There would be no significant effects to fisheries under Alternative 2. Thinning in the units would have minimal to no effects on the fish resources in the project area. Four of the five units contain Class IV streams (Table 3-2). Class IV streams do not have stream buffers. However, to minimize sedimentation, trees would be felled and split yarded away from these streams. Any slash that fell into streams would be removed. This would minimize the amount of sediment entering the streams and karst systems that might affect fish resources downstream.

This alternative proposes to construct 2.6 miles of new road without stream crossings. Minimal effects can be expected with this new construction. Adherence to Forest-wide standards and guidelines and BMPs would mitigate impacts to the fish resources.

Along the 16.5 mile haul route there are 6 Class I, 5 Class 2, 1 Class III, 14 Class IV, and 15 non-stream crossings. There are five "red" culverts along the proposed haul route (Tables 3-4 and 3-5). One "red" culvert on the 1445000 road was cleaned of all debris blockages during the spring of 2003, effectively re-establishing fish passage.

Two "red" culverts are scheduled for replacement under this alternative (Table 3-4). In addition, one log bridge and two other blocked culverts are also scheduled for replacement (Table 3-4). Three additional "red" culverts are recommended for replacement in the future under deferred road maintenance (Table 3-5).

Table 3-4 Structures on the haul route scheduled for replacement

Road	Milepost	Feature	Concern	Class	Notes
1445000	3.302	Red Culvert	Damage/ Fish passage	II	Structural damage, **scheduled** to be replaced with 24 inch culvert
1445000	6.495	Log Bridge	Safety	II	Replace w/ modular bridge (fish recommendation) or large culvert - **scheduled**
1445290	0.132	Culvert Pipe	Beaver	II	Inlet blocked by beavers, most flow diverted parallel to road into beaver complex, **scheduled** for correction.
1445290	0.199	Log culvert	Beaver	II	Structure partially collapsed at outlet, road washed out. **Scheduled** for installation of larger culvert.
1445630	1.527	Red Culvert	Beaver/ Fish passage	I	Outlet blocked by beaver, **scheduled** to be replaced w/ 36 inch culvert or larger. Failed fish passage criteria for gradient and constriction

Table 3-5 Red culverts on deferred road maintenance schedule for future replacement

Road	Milepost	Feature	Concern	Class	Notes
1445000	3.123	Red Culvert	Fish passage	I	Failed fish passage criteria for constriction and blockage. **Blockage corrected** during Spring of 2003. **Recommend** replacement.
1445000	3.826	Red Culvert	Beaver/ Fish passage	II	Twin pipes, cleaned of debris 05/2003. Failed fish in gradient, constriction, and perch. **Recommend** replacing w/ 36" or greater culvert
1445600	0.225	Red Culvert	Fish passage	II	Failed fish passage criteria for gradient and perch. **Recommend** replacing culvert after assessing the severity of the perch and gradient failures.

Ten additional "red" culverts are in the project area, but not on the haul route. Two of these "red" culverts are recommended for replacement on the 1446000 road. The remaining eight "red" culverts would be prioritized by location, access, and severity of fish passage failures and placed on deferred maintenance for replacement in the future as funding allows. The replacement or corrective maintenance on "red" culverts consists of designing and the subsequent installation of a structure that will maintain fish passage during various stream flows (USDA 2002).

ESSENTIAL FISH HABITAT (EFH) ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 requires all federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may affect essential fish habitat (EFH). EFH is defined as *"those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity"* (Federal Register Vol 67). Freshwater EFH in Alaska includes all streams, lakes, ponds, wetlands, and other water bodies currently and historically accessible to salmon in the state. Marine EFH for salmon fisheries in Alaska includes all estuarine and marine areas utilized by Pacific salmon of Alaska origin, extending from the influence of tidewater and tidally submerged habitats to the limits of the U.S. exclusive economic zone (NPFMC 1998).

Essential Fish Habitat provides for the six different stages of the Pacific salmon life cycle: 1) spawning and incubation of eggs, 2) juvenile rearing, 3) winter and summer rearing during freshwater residency, 4) juvenile migration between freshwater and estuarine rearing habitats. 5) marine residency of immature and maturing adults, and 6) adult spawning migration.

Project Description

A complete description of the proposed action can be found in Chapter 1. Refer to Chapter 2 for fisheries related concerns and subsequent mitigations. Timber harvest

would not occur in riparian management areas of special concern to fish, other aquatic resources, and wildlife.

Assessment

The EFH in the project area is primarily freshwater, although the Port Alice log transfer facility (LTF) and the Camp Cove LTF could potentially affect marine habitats.

Freshwater EFH

The 37 miles of Class I streams that provide EFH for pink, chum, sockeye, and coho salmon are not located within or near the proposed thinning units, but are within the project area. The project area contains six Class I stream crossings that have failed USDA Forest Service fish passage requirements. The road reconstruction and maintenance needs required to access the thinning units and LTFs contain structures that span two of these Class I streams. One structure spanning a Class I stream is scheduled for replacement. The remaining structure spanning a Class I stream was cleaned of all debris blockages during the spring of 2003, effectively re-establishing fish passage. It still fails the thresholds for constriction, but would not be replaced due to the expenses involved. The remaining four Class I stream crossings in the project area would be prioritized in order of need and corrected as time and funding allows. The 2.6 miles of new road construction does not cross any Class I, II, III or IV streams.

The Forest Service has concluded that reconstruction and maintenance of roads over Class I streams "may adversely affect" EFH. Table 3-6 includes fresh water life stages of Pacific salmonid that could be affected by road reconstruction and maintenance. No Class I streams are located within or near the proposed thinning areas; hence EFH would remain unaffected. The reconstruction and maintenance of roads encompass varying degrees of activities. The maintenance phase can include but is not limited to brushing, cleaning debris-blocked culverts, ditch maintenance, grade and shape the roads. The reconstruction phase includes re-capping the road surface and replacing culverts and bridges. All activities occur on the original road footprint. All maintenance and reconstruction activities would adhere to the applicable best management practices (BMPs) and mitigation measures to effectively reduce or eliminate adverse effects on EFH.

EFH could be adversely affected by the maintenance and reconstruction activities. The affected features include but are not limited to substrate composition, water quality, temperature, channel gradient, food availability, habitat complexity, and recruitment of LWD to the stream channel. Road re-construction could increase sediment delivery to the streams, increasing turbidity for short periods and decreasing the suitability of spawning gravels. The potential for these adverse reactions do exist, but the net long-term benefit of replacing structures failing fish passage criteria outweighs the potential adverse effects that could occur. These adverse affects would be minimized by the BMPs and mitigation measures disclosed later in this document.

Surface erosion from roadbed surfaces, drainage ditches and cut-and-fill surfaces can impact fish habitat below the right-of-way. Traffic levels and vehicle type break down surface material producing finer surface gradation increasing sediment

transport from the road (Kahklen 1999). Kahklen's research showed that steep road gradients, high traffic level, and poor road surfacing produced larger quantities of sediment. Increases in fine sediments cause sedimentation of spawning gravels increasing mortality of eggs and alevins. Sediment aggregation in streams can reduce pools and other fish habitat. Applicable BMPs and mitigation measures would be employed to negate or eliminate the potential for these adverse effects.

The fish located in the area of this project are all preyed upon by other fish, numerous birds, small and large terrestrial mammals, marine mammals and aquatic invertebrates. A decrease in prey populations could directly influence the predator species. However, the proposed activity would have minimal affects upon the fish populations, resulting in minimal affects to the predators.

Marine EFH

The use of the Port Alice LTF and Camp Cove LTF "may adversely affect" the EFH for various life stages of Pacific Salmon (Table 3-6) as well as the life stages of various marine species (Table 3-7). These two LTFs were constructed during past logging activities. LTFs can affect marine EFH by: 1) covering intertidal habitat with shot rock fill, 2) leachates from sinking bark affecting water quality, 3) bark accumulation smothering aquatic plants and animals that are potential food for marine species (listed in Table 3-7). Barging the logs during this operation would mitigate some of these adverse affects. No logs would be placed in the water, hence little to no bark accumulation would occur.

The Port Alice LTF is located at T70 R77E Section 15. This location last saw activity during the Heceta-Sawfly sale, which ended in May 2001. The last known bark monitoring dive took place in 2001, resulting in zero acreage zone of deposits (USDA 2002). The LTF is in need of maintenance to become operational. The whole LTF pad needs a two-foot lift of rock. The rock ramp needs improvement to be operational at all tides. Currently it cannot be used at low tides. The settling pond has some drainage problems that can be corrected by replacing the entire pipe or adding an extension onto the current pipe. There are no bulkheads, buoys, or docks remaining at the site. Applicable BMPs would be followed during all phases of reconstruction, maintenance, and operation of this LTF. Refer to the section on Mitigations in Chapter 2 for specific examples.

The Camp Cove LTF, also referred to as Four Mile, is located on State land at T70S R78E Section 20. This location has not been used as a log transfer site for a number of years. This site is proposed as a second option to reduce hauling distance for the project. This LTF would require some work to become operational. Any work performed by the Forest Service on the LTF would follow all applicable BMPs.

Table 3-6: Fresh water life stages of Pacific salmonid that could be affected by road reconstruction and maintenance

Species	Eggs and Larvae	Juveniles Fresh Water (fry-smolt)	Juveniles Estuarine	Adults, fresh water
Coho (*Oncorhynchus kisutch*)	X	X	X	X
Pink (*Oncorhynchus gorbuscha*)	X	X	X	X
Sockeye (*Oncorhynchus nerka*)	X	X	X	X
Chum (*Oncorhynchus keta*)	X	X	X	X

Table 3-7 Marine species and life stages that could be affected by LTFs

Species	Late Juveniles	Adults
Arrowtooth Flounder (*Atheresthes stomias*)	X	X
Pacific Cod (*Gadus macrocephalus*)	X	X
Pacific Ocean Perch (*Sebastes alutus*)	X	X
Walleye Pollock (*Theragra chalcogramma*)	X	X
Dusky Rockfish (*Sebastes ciliatus*)	X	X
Shortraker/Rougheye Rockfish (*Sebastes borealis*)	X	X
Yelloweye Rockfish (*Sebastes ruberrimus*)	X	X
Sablefish (*Anoplopoma fimbria*)	X	X
Sculpin (*Cottidae* family)	X	X
Skate (*Rajidae* family)	X	X
Flathead Sole (*Hippoglossoides elassodon*)	X	X
Rex Sole (*Glyptocephalus zachirus*)	X	X

Mitigation Measures

Forest Service standards and guidelines and best management practices (BMPs) initiated as mitigation measures for the entire project area would minimize the potential adverse effects on EFH. Mitigations are listed in Chapter 2.

Conclusions

These mitigation measures would avoid or minimize the effects of the proposed commercial thinning on Essential Fish Habitat. Impacts to EFH are likely to occur through unforeseen events such as landslides, debris blockages and road failures. Best management practices and standards and guidelines are in place to effectively deal with any unforeseen events. National Marine Fisheries Service will receive a copy of the EA as stated in the agreement, and the Forest Service will continue the consultation process with the National Marine Fisheries Service.

GEOLOGY, MINERALS, AND KARST

This section provides an overview of the geology, minerals and karst resources of the project area. Information in this report is from the Forest Service's GIS database and field surveys of the project area. A Forest-wide treatment of geology, minerals and karst resources may be found in the Forest Plan Final EIS, Chapter 3, and the Forest Plan, Chapter 4 and Appendix I.

AFFECTED ENVIRONMENT

Geologic Setting

The project area is predominately underlain by the Silurian aged Heceta limestone. The Heceta limestone is described as being light gray to gray, massive, and is fossiliferous with corals, algea, and brachiopods. The northern half of the Port Alice unit is underlain by conglomerate. The Heceta formation in the project area contains limestone with extremely pure calcium carbonate. Chemical analysis of limestone samples collected from karst landscapes on nearby northern Prince of Wales Island and surrounding islands indicated calcium carbonate concentrations ranged from 92 to 99 percent (Mass et al. 1992).

Minerals and Mining Claims

The U. S. Bureau of Mines, during field investigations from 1990 to 1994, did not find any mines, prospects, or mineral occurrences in the project area (Maas et al. 1995). Bureau of Land Management mining claim activity reports indicate that there are no current mining claims in the project area.

Karst Resource

Karst is a comprehensive term that applies to the unique topography, surface and subsurface drainage systems, and landforms that develop by the action of water on soluble rock (limestone, marble, and dolomite in Southeast Alaska). The dissolution of the rock results in the development of internal drainage, producing sinking streams (streams that sink into the streambed or karst features), closed depressions, sinkholes, collapsed channels, and caves (White et al. 1995).

Karst has developed in the project area. The karst development has been greatest along local and regional faults, along fracture systems, and along geologic contacts. The last glaciation significantly modified the topography of the project area and left thick deposits of glacial till on the lower elevation areas and scoured the tops and sides of limestone knobs.

The geology and climate of Southeast Alaska are particularly favorable for karst development. About 515,000 acres of very pure carbonate are located on the Tongass National Forest (Baichtal and Swanston 1996). Karst has developed to varying degrees in all carbonate blocks because of fractures in the carbonates, high annual precipitation, and peat lands adjacent to the carbonate bedrock. The Tongass National Forest contains the largest known concentration of dissolution caves in Alaska.

Forest Plan Standards and Guidelines

Karst imposes special land management challenges. Recognizing this, the Tongass National Forest incorporated karst management standards and guidelines in the Forest Plan. These standards and guidelines categorize karst areas by their vulnerability to being adversely affected by management activities. Vulnerability is a function of the extent of karst development, the openness of the karst system, and the sensitivity of other resources that benefit from the karst groundwater systems. Karst in the project area has three vulnerability characterizations.

Low Vulnerability Karst

These are the carbonate areas most modified by glaciation. On Heceta Island, they generally have a deep (over 40 inches) covering of glacial till and little or no epikarst exposed at the surface. Epikarst is the upper surface of karst, consisting of a network of intersecting fissures and cavities that collect and transport surface water and nutrients underground. Epikarst depth can range from a few centimeters to tens of meters. Instead of the epikarst fins being ground off, as they are on northern Prince of Wales Island, the Heceta Island epikarst seems to be intact yet buried in glacial till. This suggests much thinner ice, possibly near the leading edge of a glacier. These often were areas of little or no slope (less than 20 percent) and were referred to as "till planes" (Landwehr and Baichtal 2001).

Moderate Vulnerability Karst

These carbonate areas have a mosaic of shallow organic and mineral soils. The soils are 20 to 40 percent organic McGilvery soils and 80 to 60 percent mineral Sarkar (less than 20 inches deep) and Ulloa (more than 20 inches deep), with minor amounts of glacial till. Moderate- to well-developed epikarst is visible at the surface. Epikarst tends to occur at elevations over 500 feet. It is located on knobs, ridges, and on the dip-slope of the bedding planes of the limestone when near the surface. Epikarst poses little threat to organic, sediment, and debris introduction into the karst hydrologic systems beneath. Partial suspension of trees when is required when logging on these lands to minimize soil disturbance (Landwehr and Baichtal 2001).

High Vulnerability Karst

Collapsed karst features, caves, sinking streams, and springs characterize high vulnerability karst. The highest vulnerability features could produce and transport the greatest amount of sediment if disturbed due to their openness. High vulnerability karst is also where the epikarst is well developed and soils are more than 50 percent very shallow organic (less than 10 inches deep, McGilvery soil type) and less than 50 percent mineral (less than 20 inch deep, Sarkar soil type). Management activities on high vulnerability karst could move organics, sediments, and debris down into the hydrologic systems beneath. The entrance area surrounding resurgences are considered high vulnerability in order to protect and maintain the environment surrounding the springs and the quality of the waters flowing from them (Landwehr and Baichtal 2001).

Catchment Area Management

These carbonate or non-carbonate areas contribute water to one or more karst hydrologic systems. In the project area, these flow from forested wetlands atop either

conglomerate or glacial till mantling carbonate. All losing water courses, whether intermittent or not, would be protected in this project by buffering or a combination of directional felling, split yarding, and yarding restrictions. A losing stream either flows into the groundwater system through its bed or flows directly into a karst feature. The non-feature, high vulnerability karst in catchment areas would not be thinned.

Karst in the Project Area

All of the proposed thinning units are partially underlain by carbonate bedrock with some degree of karst development. The karst is mostly low vulnerability and has a blanket of glacial till on top. These areas have high vulnerability karst, specifically karst features. Ninety-one features were identified: seventy-five are in proposed thinning units. Most features are till-lined sinks, some taking water. These high vulnerability karst features have the most potential for adding sediment and debris into the karst groundwater system. This karst was harvested in the past by a method that rarely employed suspension. Deep furrows in the glacial till are evidence of past skid trails. Many skid trails are along linear geologic expressions, which are often coincident with karst development. This is where most collapse features occur.

Port Alice Unit

The northern half of the unit is underlain by conglomerate bedrock and slopes range from 10 to 40 percent. The southern half of the unit is underlain by carbonate bedrock, slopes range from 20 to 40 percent, and the topography is undulating. Four small sinkholes 6 to 12 feet deep are in topographic lows in the southern half of the Port Alice unit. Two of the sinkholes take surface water seepage.

Crooked Hook Units

The three Crooked Hook units are all underlain by carbonate bedrock. The karst is considered low vulnerability with occasional high vulnerability karst features. The depth of till varies in the units. The soils are mostly internally drained. Surface epikarst is either masked by deep till or absent. Most sinkholes are till filled, and surface streams are nearly absent. Epikarst occurs on the tops of the knobs. Sinkholes occur in topographic lows. Thirty-eight karst features were identified in the three Crooked Hook units.

Because the sinkholes are located in topographic lows and past yarding corridors are located in the topographic lows, previous timber harvest has filled some sinkholes with sediments. Heavily used yarding corridors run from spar trees to saltwater. A few sinkholes have piped out sediment and the sediments filling the sinks from timber harvest are actively collapsing into the sinks. Many of the larger sinkholes are ponding water. This seasonal ponding is a function of sediment filling karst features and soil compaction resulting from past yarding practices.

Warm Chuck Unit

The unit is entirely underlain by carbonate bedrock and is covered with till to varying depths. Karst is moderate vulnerability with occasional high vulnerability features. Epikarst is moderately developed throughout the unit and is most evident on hilltops. Swales and valley floors are covered with relatively deep till. Collapse features are expressed as shallow sinkholes in the valley bottoms. Thirty-three karst features were

identified in the unit. No caves were found. Small amounts of surface water will seasonally pond and flow toward a few sinks. This seasonal ponding is a function of sediment filling karst features and soil compaction resulting from past yarding practices. Through most of the year, no surface water is present in the unit.

ENVIRONMENTAL CONSEQUENCES

Effects on Minerals

The proposed action would have no effects on mineral resources.

Effects on Karst

Although the proposed action would result in minor and short-term effects, there would be no significant adverse effects to karst and cave resources.

Karst has separate issues and concerns from other landforms because karst is a three-dimensional landform with closely integrated surface and subsurface processes. Groundwater flows relatively slowly through porous rock and soil, or through fractures, in non-karst terrain. In karst terrain, groundwater may flow relatively quickly through complex underground systems of fissures and caves. Concerns primarily involve potential changes of groundwater flow in these underground systems. Any management activity that causes sediment or organic debris to build up in the subsurface drainage system decreases its capacity and may force the water to the surface. Similarly, any management activity that increases the volume of water flowing underground can also make surface flow more likely.

Sediment transport has affected karst systems because of the scale of past harvest. The initial flush of sediment and debris with the first storm cycles immediately following harvest probably delivered the majority of this material into the karst systems. Sediment was transported underground to distant springs, and due to blockage of underground passages, surface stream flow and erosion increased in some areas. Improvements in current harvest practices lessen these effects. These improvements include partial cutting, reduced harvest unit size, logging systems that achieve at least partial suspension, and extending the rotation period.

The proposed thinning would have the short-term effect of initially increasing water flow in the project area. However, it is not expected to have significant long-term effects on water flow. The removal of forest vegetation temporarily increases the water available for surface or subsurface flow until the vegetation grows back. This could increase groundwater recharge, and surface water flow during major rainstorms could occur more frequently. In the case of commercial thinning, this may be desirable, returning the forest to a closer-to-natural canopy closure.

Thinning of Karst Buffer Zones

The Forest Plan, Karst and Cave Resources, Forest-wide standards and guidelines, state under "Strategy" that we should, "Maintain, to the extent feasible, the natural karst processes and the productivity of the karst landscape while providing for other land uses where appropriate." These guidelines state under "Management" that we should "Integrate and coordinate karst management with the management of other

resources. Consider the function and biological significance of the entire karst landscape; recognize the importance of protection of karst systems, not solely specific karst features." Forest Plan standards and guidelines do not address the harvest of second-growth timber on karst lands. In this project, the Forest is embracing an adaptive management approach to meet the goals for karst, although thinning to improve karst is not addressed specifically in the Forest Plan. The Forest Plan ROD, page 1, paragraph 4: "Recognizing that conditions on the Tongass National Forest do not remain static and that new information is constantly being developed, the Forest Plan embraces an adaptive management approach. This approach refers to the continuous process of action-based planning, monitoring, research, evaluation, and adjustment, with the objective of improving implementation to achieve desired management goals and objectives."

Forest Plan standards strive to "focus on the openness of karst and its ability to transport water, nutrients, soil and debris, and pollutants into underlying hydrologic systems." The prescriptions in this project strive to achieve this goal with the intention to improve current conditions. When the stands were previously harvested, large amounts of sediment were transported into the karst features either by erosion and transport or by the effects of yarding through the features. The karst systems are trying to clean themselves out as is evidenced by the settling noted in several sinkholes, but they have not recovered as of yet. Where the larger streams sink, water now backs up, forming pools and flooding the forest floor surrounding the features. Sediment and debris mobilized into the system during past harvest is restricting the flow through the systems. One way to accelerate the recovery process is by hastening hydrologic recovery of the areas. This can be accomplished by opening the forest canopy with the proposed thinning.

The project proposes to harvest second growth and yard the timber from a portion of the 100-foot no-harvest buffer. The benefit of increasing on-the-ground precipitation and tree spacing to reflect more natural conditions outweighs the threats from harvest. Careful design, implementation, and sale administration can insure the goals of protecting karst are met. Sinkholes in the proposed units would be buffered from their center to just outside the lip of the sink (about 25 feet), allowing for thinning of the remaining 75 feet that would normally be in a 100-foot no-harvest buffer. All harvested timber would be directionally felled from the slope break of karst features and split yarded from the features. Any material landing on the slope break of a feature or within a feature would be hand removed. No yarding across, through, or beside a feature would be allowed. Directional felling and split yarding away from the karst depressions and features would provide adequate protection for water quality and karst features.

Outside the FSL Thinning Study, these sites would be monitored to see if the objectives of the prescriptions were met. A minimum of three sites would be chosen in each the different treatment areas and control blocks. The effectiveness of the prescribed buffers, yarding and felling restrictions, and documenting changes in flow, piping, settling, and sedimentation rates would be recorded.

Knowledge gained from this study is pertinent to karst management because there are over 100,000 acres of second growth on karst located in timber management LUDs. In the *Karst Management Standards and Implementation Review, Final Report of the Karst Review Panel* (2002) the panel summarized the lengthy discussions on second

growth management. The panel thinks that commercial thinning of overstocked stands would hasten a return to more desirable stand conditions on historically harvested sites. The panel thinks this type of thinning could be safely conducted on low and moderate, and possibly selected high vulnerability karst sites.

Table 3-8 Key indicators of effects of the alternatives on karst

Key Indicators	Alt. 1	Alt. 2
Acres of high vulnerability karst in the units	0	42
Acres of high vulnerability karst thinned	0	27
Acres of moderate vulnerability karst in the units	0	148
Acres of low vulnerability karst in the units	0	210

Alternative 1

Timber harvesting and related activities would not take place in Alternative 1. Natural erosion and transport processes, including mass wasting, surface erosion, and stream erosion, would continue. All of these natural processes contribute sediment to karst systems.

Alternative 2

Alternative 2 would commercially thin 27 out of 42 acres of high vulnerability karst. Three acres of high vulnerability karst are in the 25-foot no-harvest buffers and 12 acres are in control blocks where no thinning would take place. The project proposes that careful thinning and the use of 25-foot buffers around karst features in these stands would hasten the hydrologic recovery of these areas and return the stands to a condition that is closer to pre-harvest tree spacing, canopy closure, and canopy interception. Many of the karst features are found in potential control stands of the FSL study where no treatment would occur. High vulnerability karst in thinning areas would be monitored to see if collapse and piping continues or accelerates as a result of the thinning. No timber would be felled into or across karst features or loosing streams and logs would not be skidded adjacent to or within these features and streams. Directional falling and split yarding away from the karst depressions would provide adequate protection for water quality and karst features. The effectiveness of this yarding and felling mitigation would be monitored.

HERITAGE

The Heritage Resource section of this report includes descriptions of the known culture history of the project area as well as a brief summary of known archaeological and historic resources on Heceta Island and past archaeological inventory efforts. A more comprehensive treatment of the archaeology of Heceta Island may be found in Ackerman et al. 1985. The broader context of culture history in southeast Alaska is set forth in *A Cultural Resources Overview of the Tongass National Forest* (Arndt et al. 1987). Goldschmidt and Haas (1998) describe traditional Native cultural uses of the area. Forest-wide standards and guidelines for heritage resources may be found in the Forest Plan pp 4-14 to 4-17.

AFFECTED ENVIRONMENT

No known archaeological or historic sites are located within the project boundaries. Archaeological field visits to the units took place in 2003. Past archaeological inventory on Heceta Island has resulted in the recording of 21 archaeological sites. These sites represent human occupation of the island as early as 8,200 years ago and as recently as the 1950s. Site types represented include stone tool (lithic) scatters, stratified shell middens, intertidal stone fishtraps, rock art, permanent villages, and canneries. The initial logging of the units approximately 70 years ago might also be considered an historic activity. The Takwanedih clan of modern day Klawock has its roots at Indian Garden Bay and Warm Chuck Inlet on Heceta Island (Campbell 1980) and considers much of the island its traditional territory.

The most ambitious archaeological survey of Heceta Island was conducted in 1985 by a team from Western Washington University (Ackerman et al. 1985) under contract to the Tongass National Forest. The team surveyed 16 timber harvest units in central and western Heceta Island as well as nearby sections of coastline and stream terraces, a total of 1,196 acres. The team excavated 210 test pits and located four significant new archaeological sites. Two of these sites have received intensive study in subsequent years.

Heceta Island has a high potential to yield important heritage resources. Appendix E of the Programmatic Agreement between the Alaska Region of the Forest Service, the Alaska Historic Preservation Office, and the Advisory Council on Historic Preservation defines areas of high sensitivity for Heritage resources as "All land between mean lower low water and 100 ft. of elevation above mean high water, with no consideration of slope." High sensitivity zones also include highly developed karst areas; areas of known historic activities, and landforms with characteristics that would be amenable to human use. The karst portions of the Crooked Hook and Warm Chuck Units are high sensitivity zones. There are no low elevation areas of high sensitivity. The lower (northern) segments of the Crooked Hook units are above 100 feet elevation.

Field visits to the Crooked Hook and Warm Chuck units were implemented in 2003 to assess and field check the need for archaeological survey in light of the sensitivity determinations. The lower portions of the Crooked Hook units were examined. No historic or archaeological sites were noted during the unit assessments. The elevation and character of the terrain precluded the need for and practicality of intensive archaeological survey.

ENVIRONMENTAL CONSEQUENCES

2003 survey of the Crooked Hook and Warm Chuck units and the results of past archaeological survey on Heceta Island indicate that no historic properties would be affected by the proposed action. No archaeological or historic sites are known to exist in or near the units, thus there would be no direct effects. Indirect effects result from increased human presence in the area. This project would not result in a significant increase in the use of the immediate vicinity and thus would have negligible indirect effects.

State Historic Preservation Office Concurrence

Since there are no identified heritage resources present in the project area, there would be no effect by either Alternative. Because no historic properties are present in the project area, the specialist report (R2003100554014) will be submitted to the Alaska SHPO with the 2003 annual report under the terms of the Programmatic Agreement (# 02MU-111001-076).

HYDROLOGY

This section provides an overview of the water resources of the project area. The key indicator used to determine project effects on water quality is sedimentation. The *Heceta Commercial Thinning Project Water Resources Report* contains field information and project area characterization.

AFFECTED ENVIRONMENT

Heceta Island is dominated by Pacific maritime climate. Annual precipitation is about 100 inches (Jones and Fahl 1994), mostly in the form of rain. Seasonal winter snowpack accumulates on the Bald Mountain alpine area (central Heceta Island).

Drainage and runoff occur by both surface and subsurface pathways. Because the geology on Heceta Island is mostly limestone (carbonate bedrock), large areas of the project drain through the subsurface karst system. Subsurface runoff occurs through either diffuse recharge (through bedrock cracks or layers of soils) or direct recharge (through open sinks or caves), depending on how open the karst system is to the ground surface. Surface water runoff occurs in areas of non-carbonate bedrock and where glacial till soils impede drainage.

The project area has been separated into numerous watersheds using the Hydrologic Unit Code (HUC) and surface topography. Although the carbonate nature of the island suggests these boundaries may not always be correct, there is no information available to delineate subsurface pathways.

There are 19 HUC watersheds in the project area, ranging in size from 188 to 2,853 acres. Number and length of streams, length of roads, area of managed lands, and wetlands are displayed and discussed in *The Heceta Commercial Thinning Project Water Resources Report*.

Streamflow Regimen for Surface Waters

The project area is well drained internally and limited to short segments of Class IV surface waters. The 17 Class IV streams in units total 0.6 miles in length (Table 3-9). Following field review, a unit boundary was moved to protect two Class II streams, one located in Crooked Hook Unit 1 and another in Crooked Hook 2. None of the streams identified in proposed thinning units contain fish. Streams and riparian areas are managed according to the Forest Plan standards, guidelines, and BMPs to provide adequate protection for water quality. Surface water lakes are dispersed in the project area and none are close to proposed units.

Wetland areas act as filters that influence volumes of runoff and water quality. Wetland size determines the effectiveness to function as a filter between the land and surface waters. Because most of the project area is underlain by carbonate bedrock and fairly well drained, wetlands are limited to a few debris-filled swales that are poorly drained (see wetlands section).

Karst vulnerability analysis (see karst section) identifies the potential for subsurface karst waters and pathways to be impacted from surface disturbances. The project area includes 75 identified karst features and 42 acres of high vulnerability karst. Thinning the second growth in these units with 25-foot buffers immediately surrounding the high vulnerability karst features would provide both short- and long-term water and karst resource protection.

Water Quality

Alaska Water Quality Standards for temperature, turbidity, and dissolved oxygen are relative to background conditions. The underlying carbonate bedrock influences water quality in this project area. Surface waters are more basic (i.e. higher pH) than in non-carbonate terrain. The U.S. Forest Service, under a memo of understanding with Alaska Department of Environmental Coordination, will meet the Alaska Water Quality Standards by implementing, applying, and monitoring Forest Plan standards and guidelines and best management practices (Forest Plan 1997).

No known registered State of Alaska domestic water sources are located in this project area. Past logging camps used local water sources to supply domestic water needs. The single remaining water use is at the Forest Service field camp area near the Port Alice log transfer facility. This water supply is separated from the proposed action by distance and drainage and would not be affected.

Sediment affects water quality as non-organic earth material that can be transported by water along the bottom of the stream or suspended in the water column. Sediment availability and size is a function of bedrock type, the physical and chemical erosion processes present, and percent of the area that is exposed soils. The bedrock type on Heceta is limestone. The dominant erosion process on limestone bedrock is generally chemical erosion, which limits the production of sediment.

Roads can generate sediment during and after construction. There are 86 miles of road in the project area and 2.9 miles per square mile road density. Individual watersheds range in road density from 0 to 5.3 miles per square mile. The internal drainage common in the project area results in fewer stream crossings and cross drainage structures relative to roads on non-carbonate bedrock. Several drainage problems identified during field review would be improved by this project. These problems include blocked culverts, inadequately sized culverts, beaver dams, and road failures (see fisheries section).

Timber harvest can generate sediment during and after harvest activity. Past harvest occurred on 50 percent of the project area, and across as much as 89 percent of a single watershed (*The Heceta Commercial Thinning Project Water Resources Report, 2004)*. Exposed mineral soils from past harvest have recovered with vegetation or thick organic soils and show no signs of sedimentation. Sediment accumulations from past harvest are apparent in several karst depressions and

sinkholes. Current harvest methods are designed to limit sedimentation and water quality degradation.

Water Yield

The removal of trees during harvest or thinning operations can alter water yield in a watershed. In the Pacific Northwest, timber harvesting has resulted in short-term increased water yield (four to five years), depending on the extent of harvested area (Burton 1997; Keppler and Ziemer 1990; and Harr 1980). Most studies suggest that at least 20 percent of a watershed needs to be harvested before an increase in water yield is evident. A decrease in water yield generally follows the increased water yield and occurs over a longer period of time, 20-100^{+} years. Hydrologic recovery refers to the recovery of water yield to the pre-harvest condition. This recovery depends on the density and species of trees. Thinning would reduce the density of trees and hence reduce the length of time needed for hydrologic recovery.

Water yield in the project area was affected when the project area was originally harvested in the early 1930s due to a decreased density of trees (*The Heceta Commercial Thinning Project Water Resources Report, 2004)*. The existing units contain 70-year-old second growth in a higher density than the original stand. This would suggest that the water yield has yet to fully recover. The proposed project would reduce the number of trees and the time needed for hydrologic recovery to occur.

ENVIRONMENTAL CONSEQUENCES

The following section describes the environmental consequences of the proposed action on hydrology resources in the project area. Although the proposed action would result in minor and short-term effects, there would be no significant effects to hydrology resources.

Thinning, road construction, and yarding of trees would result in exposed soils, erosion, and sedimentation. Sedimentation is the key indicator used for comparing alternatives and can be measured by analyzing the acres of thinning, miles of road, miles of stream, and acres of karst.

Thinning can generate sediment by exposing soils during felling and yarding of trees. Because the acres proposed for thinning in this project are dispersed over six different watersheds, are partial harvest, and account for no more than 20 percent of any given watershed area, the sediment generated by harvest would be negligible at a watershed scale. Hydrologic recovery would result from thinning by reducing the number of trees in the existing second growth. Although the acreage of thinning is less than 20 percent of any watershed, the thinned stands would more closely resemble the original stand density.

Stream temperature would not be affected because partial harvest prescriptions would retain shade in the units and the stream lengths are extremely short. If the project included more harvest acres or road miles, greater effects could be expected to sedimentation, water yield (Harr 1980), stream temperatures (Meehan 1970), and surface water networks (Wemple et al. 1996).

Road construction can generate sediment and cause sedimentation in streams (Bilby et al. 1989: Kahklen and Hartsog 1999). Sediment generated is proportional to the length of road, number of stream crossings, proximity to open karst features, level of maintenance, and density of road traffic. There are no stream crossings along the 2.6 miles of proposed new road construction, all karst features would be avoided, and roads would be constructed according to the Forest Plan standards, guidelines, and BMPs to provide adequate protection for water quality. These conditions suggest that sedimentation resulting from road construction would be minimal.

Road reconstruction (4.5 miles) and maintenance (12 miles) would improve drainage and reduce the risk of sedimentation. Road reconstruction would replace culverts to provide adequate fish and water passage, unplug culverts, and add a layer of road surface material to reduce the potential for rutting and sediment transport to streams.

Miles of stream and acres of high vulnerability karst indicate the potential for sediment to affect surface and subsurface streams. Surface water streams and open karst features transport sedimentation. There are no fish or water quality streams located in proposed thinning units. The 17 segments of Class IV streams identified in proposed thinning units total 0.6 miles and the high vulnerability karst totals 27 acres. Several karst features that are open to the surface or are taking surface water (Class IV) streams or seeps would be buffered from harvest. The buffers would limit erosion around these features and protect the water quality.

The buffer size recommended for high vulnerability karst in this project (25 feet) has been developed in order to improve water quality in the second growth (see karst section). This adaptive management approach considers the existing second growth conditions, the proposed action, and current research and reports associated with karst and forest management.

The Karst Review Panel report, *Karst Management Standards and Implementation Review* (2002) recommends thinning second growth in karst areas as a restoration activity that could have important offsite, or downstream, benefits. All sensitive karst features would receive 25-foot no-cut buffers. These buffers would protect the immediate area surrounding the karst feature from soil erosion and sedimentation, while restoring drainage and stand density outside the 25-foot buffer.

Table 3-9 Key indicators of effects of the alternatives on water quality

Key Indicator	Alt 1	Alt 2
Miles of Class IV Streams Affected by Thinning	0	0.6
Acres of Proposed Thinning	0	400.0
Acres of High Vulnerability Karst Proposed for Thinning	0	27.0
Miles of New Road Construction	0	2.6
Miles of Road Reconstruction	0	4.5

Alternative 1

With Alternative 1, existing second-growth stands would remain densely populated with canopy closure and little understory vegetation. Hydrologic recovery would occur simultaneous to vegetation succession and could take several decades. No roads would be constructed and the existing road drainage would not be improved. Existing stream crossing structures and road maintenance needs would be addressed according to the Forest road maintenance schedule.

The direct effects of Alternative 1 would be slower rates of hydrologic recovery and poor drainage along portions of the existing road system. An indirect effect of Alternative 1 would be a lack of information regarding the results of thinning in densely stocked second growth.

Alternative 2

Increased sedimentation resulting from the proposed action would be short-term (less than one year) and of minor intensity. The sedimentation would be minor because the project is dispersed over six watersheds and thinning would not involve more than two percent of the project area or 20 percent of any given watershed. Additionally, the harvest methods would be designed to reduce erosion and sedimentation. The 0.6 miles of Class IV stream have no fish and show limited potential to transport sediment to downstream areas. Any trees thinned near the streams would be felled away from and split yarded around the stream sections. Where the streams flow into karst features, there would be a 25-foot no-harvest buffer and trees within 100 feet would be felled away from features.

Minor increases in windthrow that exposes soil could result from the proposed action. Exposed soils resulting from windthrow sometimes cause sedimentation in downstream areas. The windthrow expected to result from the proposed action is minor (10 acres more than would be expected with the no action alternative) (see silviculture section).

A better understanding of second growth management would result from the FSL study of the thinning project. The results of this study would contribute much needed information for managing second growth forests on the Tongass.

The thinning proposed in this project would reduce the time needed for hydrologic recovery. Hydrologic recovery depends on the succession of vegetation and hence the number of trees in a watershed. A reduction in the number of trees by thinning would reduce the time needed for hydrologic recovery in these stands.

RECREATION

AFFECTED ENVIRONMENT

Recreation activity on Heceta Island is light and dispersed and includes hunting, hiking, fishing, and boating. People who recreate on Heceta Island must reach the island by boat or floatplane. No communities or dwellings are located on the island. The Forest Plan (Appendix F p F-18) identifies one boat anchorage near the project area in Warm Chuck Inlet. There is a small boat dock near Camp Island.

The Forest Service has developed the Recreational Opportunity Spectrum (ROS) system to help identify, quantify, and describe the variety of recreational settings available in National Forests (pp 4-46 to 4-52).

The following are the different ROS class designations.

1. Primitive
2. Semi-Primitive Non-Motorized
3. Semi-Primitive Motorized
4. Roaded Natural
5. Roaded Modified
6. Rural
7. Urban

Each ROS class has seven elements and each element has a standard and guideline (Forest Plan pp 4-48 and 4-50) to direct recreation activity and level of use in each ROS Class.

The seven ROS setting elements:

1. Visual quality
2. Access
3. Remoteness
4. Visitor management
5. On-site recreation development
6. Social encounters
7. Visitor impacts.

The project area includes two ROS classes: Roaded Modified and Semi-primitive Motorized.

Table 3-10 How the two ROS classes differ by the seven ROS elements

ROS Element	Roaded Modified	Semi-primitive Motorized
Visual Quality	Max. Modification	Partial Retention
Access	All Forms	All Forms
Remoteness	Nearby impacts occur Distant impacts occur	Nearby impacts are rare Distant impacts occur
Visitor management	Few	Few
On-site recreation development	Development Scale II	Development Scale II
Social encounters	20 parties per day	10 parties per day
Visitor Impacts	Are noticeable	May be noticeable

The Crooked Hook units 1, 2, and 3, Port Alice unit, and the eastern two-thirds of the Warm Chuck unit are classified Roaded Modified. The western one-third of the Warm Chuck unit and the old-growth portion of Port Alice is classified Semi-primitive Motorized. The Forest Plan (pp 4-48 and 4-50) describes ROS classes in more detail.

ENVIRONMENTAL CONSEQUENCES

Environmental consequences associate with recreation on Heceta are directly linked to access. Road closures, new roads and improved roads could result in recreation use fluctuation. However, due to the limited road construction (2.6 miles) associated with this project no increase in access or recreation pressure is expected.

Alternative 1

This alternative would not change the recreation demand, use or access in the project area. Recreation carrying capacity associated with hunting, fishing and hiking would not change from its current level. ROS classes would not change.

Alternative 2

The ROS settings for all portions of the five thinning units would be classified as Roaded Modified after thinning. This alternative proposes thinning 25 to 50 percent of the stands. The sounds of truck and logging activity would be prevalent during harvest, but they would be of short duration and difficult to pinpoint due to the lack of visual clues created by openings in the forest canopy.

The 2.6 miles of new road constructed would remain open after harvest. Because of additional access to the project area, recreation access could increase slightly. The estimated recreation effects to recreation would be minor with very little change.

SCENERY

Heceta Island is one of a large and varied cluster of islands located west of Prince of Wales Island. They are part of a visual character type known as Kupreanof Lowlands. Visual effects are seen from the air and most waterways that result from timber management. Most of the island is designated for timber management and will continue to be managed as second-growth forest.

The key indicator used to measure the effects to scenery is the extent to which proposed thinning corresponds to the visual quality objectives (VQOs) for each unit.

AFFECTED ENVIRONMENT

Visual Character Type of Heceta Island

Heceta Island and the Kupreanof Lowlands are characterized by rolling terrain exhibiting a local relief of 300-500 feet and a maximum relief of 1,000-1,500 feet separated by an intricate network of waterways. Parts of the island are plains only a few feet above sea level. Scattered, block-like mountains, with rounded hummocky summits 2,000 – 3,500 feet in elevation rise above the general level of the lowland.

Numerous small rocky islands, shorelines, and rock reefs are evident in the intricate network of waterways. Generally, other rock forms are isolated and visually

insignificant. There are some outstanding limestone cliffs in these areas. Outer coasts exposed to the open ocean exhibit a variety of shoreline forms such as occasional small gravel beaches, small cliffs and rocky promontories.

The island is largely covered with spruce and hemlock forest except for infrequent higher elevations where scattered muskeg and alpine deciduous species occur. There are also significant areas of muskeg-lodgepole pine. Vegetation on the exposed outer coastal areas is influenced by strong winds and spray, creating much diversity. Grass meadows are found along many of the small waterways particularly at the heads of many of the bays. Logging throughout substantial portions of these areas has shaped the visual character of this landscape.

Visual Priority Travel Routes and Use Areas

The Forest plan includes the designation of Visual Priority Areas, such as Travel Routes and Use Areas. There are three Visual Priority Areas near this proposed project.

1. Sea Otter Sound to Cape Pole
2. West Coast Waterway – Karheen Pass to San Christoval Channel
3. Warm Chuck Inlet

Visually sensitive areas around Heceta Island associated with saltwater routes and use areas include a small boat route across Sea Otter Sound that passes about three miles off the north shore, the West Coast Waterway passing between Heceta Island and Prince of Wales Island, and an anchorage at the head of Warm Chuck Inlet.

Sea Otter Sound gets a moderate level of use by commercial and sport fishers, recreation boaters, and those people traveling between Prince of Wales communities and Edna Bay.

The West Coast Waterway gets light to moderate use by a wide variety of watercraft including commercial boats, kayaks, and recreational boaters. Small cruise ships have also occasionally used this waterway. Commercial and sport boats occasionally use the anchorage in Warm Chuck Inlet.

Visual Quality Objectives

Forest-wide scenery standards and guidelines include Visual Quality Objectives (VQOs). They are measurable goals used for the management of visual resources. VQOs vary by land use designation and apply to any activity (including thinning) that could affect the visual character of the landscape.

Visual Quality Objectives are determined by a variety of physical and sociological parameters including Distance Zone, which is used to determine the distance between the potential viewer and the managed activity. The Forest Plan defines four distance zones used in the application of VQOs.

1. Foreground - located less than 0.25 miles from the viewer
2. Middleground – located between 0.25 miles and 3 to 5 miles from the viewer
3. Background – located from 3 to 5 miles to infinity

4. Not Seen – located in areas not seen from Visual Priority Travel Routes and Use Areas

There are three VQOs in the project area: Retention, Modification, and Maximum Modification.

Retention VQO. "Design activities to not be visually evident to the casual observer." (Forest Plan p 4-76) This VQO applies to the Old-growth habitat LUD where the Port Alice unit is located. Like the other four units, this unit consists of overstocked second growth from past harvest. Under Retention, activities may only repeat form, line, color and texture that are frequently found in the characteristic landscape. Changes in the qualities of size, amount, intensity, direction, pattern, etc.. should not be evident.

Modification VQO "Activities may visually dominate the characteristic landscape, but must have visual characteristics similar to those of natural occurrences within the surrounding area or character type. This VQO should be met within one year in the foreground distance zone and within five years in the middle and background distance zones following project completion. When planning activities, use naturally established form, line, color, and texture found in the landscape." (Forest Plan p 4-76) However, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrence within the surrounding area or character type. Additional parts of these activities such as structures, roads, slash, root wads, etc., must remain visually subordinate to the proposed composition.

Maximum Modification VQO "Activities may dominate the characteristic landscape, yet when viewed as background, should appear to be a natural occurrence." (Forest Plan p 4-77) When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established from, line, color, or texture. Alterations may also be out of scale or contain detail that is incongruent with natural occurrences as seen in foreground or middle ground.

Table 3-11 Project area land use designations and visual quality objectives

LUD	Foreground	Middleground	Background	Not Seen
Old-growth Habitat	Retention	Retention	Retention	Retention
Timber Production	Modification	Max. Modification	Max. Modification	Max. Modification

Existing Visual Condition

Much of the northeast portion of Heceta Island was extensively harvested between the early 1970s and mid 1980s. This area is carpeted by fine-textured, dense second growth. Interspersed throughout this area of second growth are a few large stands of coarser-textured second growth resulting from harvest in the 1950s and 60s. Strips of old growth still cover many of the slopes directly behind the shoreline.

From an aerial perspective, this massive expanse of primarily 30- to 50-year-old second growth results in a Type IV visual condition (a moderately altered condition). From Sea Otter Sound boat route about three miles offshore, the landscape is a Type III visual condition (appears only slightly altered). This is due to the remaining old-growth stands on the visible shoreline slopes, the restoration of significant texture to the harvested slopes, and the effect of the viewing distance in softening the textural differences between the managed and old-growth stands.

The northwestern lobe of the island has been harvested more recently than the northeast portion. These later harvests occurred from early 1980s to early 1990s. As a result, visual effects from clear-cuts are seen over much of this part of the island. Though much of this harvest area has greened-up, scale of the overall harvest and blocky shape of many of the units has created a Type V visual condition (heavily altered landscape) as viewed from the air. From the anchorage in the lower arm of Warm Chuck Inlet much of this harvest is not evident because of foreground vegetation or landform screening. Hence, the viewshed seen from the anchorage is in a Type IV visual condition (moderately altered landscape) due to some visible harvest on the western and southern slopes of this inlet.

The landscape seen at the head of Port Alice is in a Type IV visual condition. There has been extensive past harvest in this area, but there has been significant regeneration of these areas in the past two decades.

Visual Quality Objectives by Unit

The following table illustrates VQOs associated with each unit as seen from Key Viewing Points. NA means the unit treatment area is not seen from Key Viewing Points at that distance zone.

Table 3-12 VQOs associated with each unit as seen from key viewing points

LUDs for each unit are: (TP) Timber Production, (OG) Old-growth Habitat

Unit Name	Foreground	Middleground	Background	Not Seen
Warm Chuck (TP)	NA	NA	NA	Max Mod
Crooked Hook 1 (TP)	NA	Max Mod	NA	NA
Crooked Hook 2 (TP)	NA	Max Mod	NA	NA
Crooked Hook 3 (TP)	NA	Max Mod	NA	NA
Port Alice (TP)	NA	Max Mod	NA	NA
Port Alice (OG)	NA	Retention	NA	NA

Port Alice unit is the only unit sharing two different LUD designations. This unit is approximately 90 percent Old-growth Habitat LUD. Due to the location, aspect and slope the effects from thinning would not be seen by the casual observer from Port Alice. Intermediate treatment would include thinning from below with leave trees spaced an average of approximately 30 feet.

The Warm Chuck unit prescription calls for strip thinning. Thinning would not be seen because of topography. Warm Chuck unit management objectives are consistent with those of Modification and Maximum Modification.

Thinning treatments associated with Crooked Hook units are all within modification and maximum modification VQO designations. The treatment faces Sea Otter Sound, a Visual Priority Travel Route. Treatment could potentially be seen in the middleground and background. However, the area is not directly seen because of buffer trees and topography.

Key Indicators

The key indicator used to measure the effects to scenery is the extent to which proposed thinning corresponds to the visual quality objectives (VQOs) for each unit.

This indicator evaluates whether thinning treatment in each unit meets or exceeds the Forest Plan adopted VQO's for those units. Thinning treatments meet adopted VQOs when the degree and nature of alteration to the natural landscape are consistent with Forest Plan standard and guidelines. Conversely thinning treatments exceed adopted VQOs when the degree and nature of alteration to the landscape are greater than the allowable limit of change.

Table 3-13 Key indicator of effects of alternatives on scenery

Effects of thinning in each unit compared to each units adopted *VQO*	**Alt. 1**	**Alt. 2**
Warm Chuck unit	Meets VQO	Meets VQO
Crooked Hook 1 unit	Meets VQO	Meets VQO
Crooked Hook 2 unit	Meets VQO	Meets VQO
Crooked Hook 3 unit	Meets VQO	Meets VQO
Port Alice unit – *in Timber Produciton LUD*	Meets VQO	Meets VQO
Port Alice unit – *in Old-growh Habitat LUD*	Meets VQO	Meets VQO

ENVIRONMENTAL CONSEQUENCES

The Visual Quality Objectives in all units would be met in both alternatives. The Port Alice unit in Old-growth Habitat LUD was the only unit in question during the project analysis. This unit has a much higher degree of visual sensitivity because of the visual quality objective Retention assigned to this unit. Retention requires that management activities strictly repeat form, line, color, and texture; which are frequently found in the landscape.

Alternative 1

In this alternative, no commercial thinning would take place in second growth. The landscape as seen from visual priority routes and use areas would continue to meet the visual quality objectives or a higher objective for these areas. No additional alterations would occur to the natural landscape. Without treatment, these stands would continue to thin naturally and evolve toward old-growth characteristics.

The expansive stands of second growth covering the northeastern lobe of the island would continue to thin naturally. The second-growth stands that are visible from Sea

Otter Sound, the head of Warm Chuck Inlet and Port Alice would start to take on their original old-growth characteristics (as viewed from these off-shore positions) after about 80 to 100 years from the time they were previously harvested. Additional effects from Sea Otter Sound could occur from future harvest on State-owned lands along the middle of this northeast coast.

Alternative 2

At a distance of 0.25 to 5 miles, (middleground) the treatment area would not show visual effects exceeding the allowable limits of change for the units designated VQO. From a key viewing point centered in Port Alice (see Figure 3-1 Viewshed Analysis below), the effects of treatment would not be visually evident to the casual observer because of existing vegetation, topography, slope, aspect and visual mitigation measures if needed.

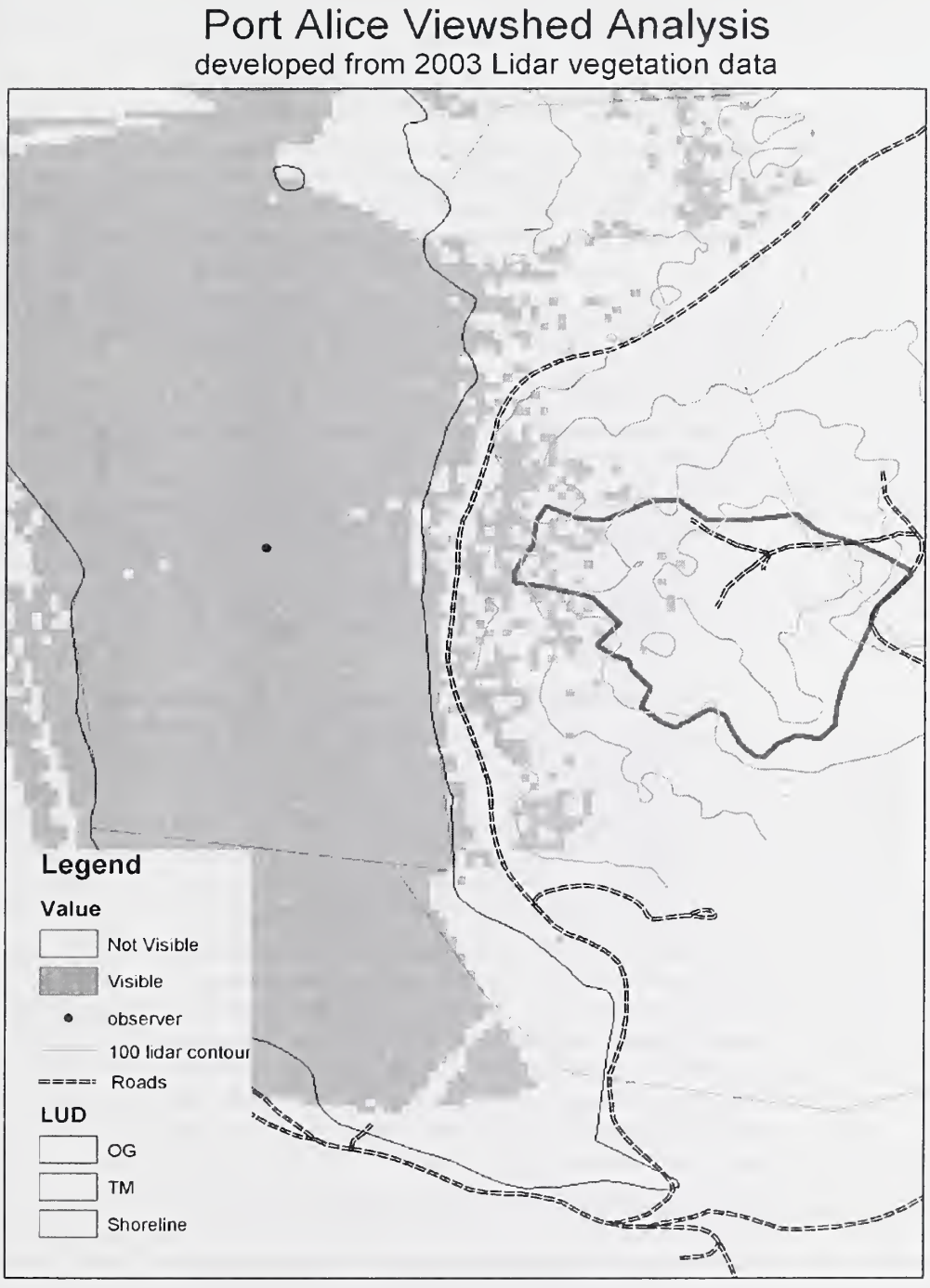
Warm Chuck unit thinning activity would be evident on the steeper slopes above the shoreline. Effects of thinning treatment in Warm Chuck Inlet meet Modification and Maximum Modification VQO guidelines for Timber Production LUDs.

Crooked Hook units 1, 2 and 3 facing Sea Otter Sound would be thinned. The only thinning activity that would be evident from these units would be strip thinning on steeper slopes just above the shoreline. These visible steeper slopes coincide with the 1,000 ft. beach fringe where small, shadowy breaks would be visible in the canopy. Most of these stands sit on flat or gently sloping terrain and any thinning in these portions would not be evident from the water. The effects would be well within the Forest Plan visual quality objective of Modification and Maximum Modification.

Port Alice unit is composed of two separate LUDs. Thinning treatment prescribed in Timber Production LUD would meet VQO Maximum Modification for this portion of the unit. Port Alice unit in Old-Growth Habitat LUD would meet VQO Retention due to minimal seen area, minimized yarding corridor widths and visual mitigation measures following treatment.

Thinning would include portions of these stands that extend about 500 feet into the 1,000-foot beach fringe. Thinning would shorten the timeframe for these stands to regain mature old growth visual characteristics as viewed from the priority use areas. Additional effects from Sea Otter Sound could occur from future development of State-owned lands along the middle of this northeast coast.

Figure 3-1 Port Alice Unit showing areas that could be seen from the water



SILVICULTURE

AFFECTED ENVIRONMENT

About 15,407 acres, or 35 percent of the 43,556-acre Heceta Island was harvested over the past 50- to 70-years. About 13,869 acres of this harvest occurred between 11 and 40 years ago. The proposed project units were harvested about 70-years-ago. About 20,898 acres or 48 percent of the island remains in productive old growth containing Sitka spruce, western hemlock, redcedar and yellow cedar. Roughly, 517 acres or 1 percent is in productive second growth resulting from natural disturbance, and 6,734 acres or 15 percent is composed of bare rock, lakes, and wetlands.

Stand Development

Two of the four stages of stand development describe the five units of second growth in the project area: stand-initiation and stem-exclusion.

1. **Stand-initiation Stage** - Stands less than 21-years-old are typically single cohort (similar age) stands in the stand-initiation stage (Harris et al. 1974 pp 73-74; Oliver et al. 1996 pp 147-148). Stand initiation refers to the re-colonization of trees and shrubs after disturbance. These are called even-aged stands because the trees begin growing about the same time following disturbance.
2. **Stem-exclusion Stage** - Densely stocked second growth over 21 years that tends to be single cohort stands in the stem-exclusion stage of stand structure (Harris et al. 1974 pp 73-74; Oliver et al. 1996 pp 147-148). The stem-exclusion stage occurs when tree density increases until the canopy closes and sunlight does not reach the forest floor. New trees do not appear and smaller existing trees die. The Thorne Bay Ranger District precommercial thinning program has treated about 2,057 acres of second growth on Heceta Island. Average age of the stands was about 24-years-old when treated.

Each of the proposed thinning units was originally harvested with axes and crosscut saws. Yarding was accomplished with a steam-powered cable A-frame yarder working from the shore of a bay or inlet adjacent to the unit. Yarding is the process of moving a tree from its felled location to a common area called a landing. A-frame yarders were connected to the stands by cables attached to a tree (spar); which raised the cable off the ground. Logging roads or skid trails radiated out from the spar in fan-shaped patterns over the harvest area. Logs were stacked on a landing under the spar and then swung down the main corridor cable to the yarder on the beach.

The ground along cable corridors was highly disturbed because logs were not suspended during yarding. In some cases these corridors are still evident. However, past activities do not appear to have adversely impacted the overall productivity of these stands. Only the most valuable trees were felled because of the intensive labor involved. Most of the proposed thinning stands still contain residual trees that were left uncut during the first harvest. These remaining trees are are almost entirely western hemlock.

Since similar conditions exist elsewhere in Southeast Alaska, the FSL study plan prescribes studying the effects of thinning in areas with residuals, as well as areas without residuals. Therefore, some residuals would be thinned in second-growth stands containing a large number of residuals.

In 1986, portions of the Warm Chuck unit were planned for silvicultural treatments under the Cone Bay Timber Sale. This plan included three thinning treatments covering about 12 acres and one regeneration harvest of 4 acres (Thorne Bay Ranger District stand folders). Roads needed to access the sale were constructed and the 4-acre regeneration harvest was cut in 1988. The contract was terminated before any of the thinning treatments were cut. No other management activities have occurred in the units since the original 1930 harvests.

Most of the knowledge about managing second-growth stands comes from research and practices conducted in the southeastern United States and in Europe (British Columbia Ministry of Forestry 1999 p1). This project is one of the first opportunities to study commercial thinning on an operational scale in Southeast Alaska. The Second Growth Management Project was a commercial thinning study contracted in the mid-1980s. It took place at various sites on Prince of Wales (Naukati, Shaheen, Winter harbor and Gravelly Creek) and Heceta Islands (Warm Chuck). It was on a smaller scale than the proposed FSL study and had design flaws that limited the usefulness of the data. The Forest Service has since determined that a new study is warranted. The proposed project may validate information from the previous study, but more importantly, it can provide new information about timber volumes, growth rates, and target stocking levels to meet different management objectives.

Project Average Biotic Conditions

The second-growth stands proposed for treatment are in the stem-exclusion stage (Oliver et al. 1996 p 152). Trees are dying because of suppression (the inability to compete for sunlight and nutrients because of overcrowding.) Understory herbs and shrubs are scarce. The stands are 94 percent second growth and 6 percent western hemlock residual trees. The second growth species composition is 67 percent western hemlock and 33 percent Sitka spruce. Live crown ratios (LCR) average 34 percent. Thirty percent LCR is low susceptibility for a crop tree to respond to thinning. Canopy cover is a single layer, which is over 90 percent closed. Average tree diameter at breast height (DBH) is about 12 inches. Average DBH growth is expected to be about 1.7 inches over the next ten years. Height-to-diameter ratios are about 98 and will increase over time. A height to diameter ratio that is approaching 100 indicates a severe wind risk (Stathers et al. 1994 p 8; British Columbia Ministry of Forestry 1999 p 23). As the height-to-diameter ratio increases, trees start to 'wet noodle' or bend over, forming an upside-down 'U'. There is evidence of this phenomenon in all units. Competition for site resources is limiting tree growth and vigor; which results in increased risk of insect and disease problems. Some stand edges have suffered wind damage and remain at risk for additional damage.

Competition for sunlight and other growth resources has severely reduced the herb and shrub cover necessary for wildlife habitat. The closed canopy conditions in the stand are promoting self-pruning of both spruce and hemlock. In general, limbs on the lower 16-32 feet are dead. The overstocked conditions that promote self-pruning also limit overall diameter growth.

Project Average Abiotic Conditions

Heceta Island has a maritime climate with plentiful precipitation. Winters are relatively mild and summers are cool. The warm waters of the Japanese current offshore and prevailing onshore winds influence the cool, humid weather conditions of the area (Ruth et al. 1979 p 3-5). Climatic data is provided by the National Weather Service for Point Baker, located on the northwestern tip of Prince of Wales Island about 40 miles north of Heceta Island.

The average August high temperature is 57 degrees Fahrenheit and the average January low temperature is 27 degrees Fahrenheit. Annual snowfall is about 16 inches. Low average summer temperatures limit the effective growing season at the site (DeMeo et al. 1992 p 10). Due to the high precipitation in the area, low soil moisture is seldom a limiting factor for tree growth. However, too much soil moisture does limit productivity on poorly drained sites (DeMeo et al. 1992 p 8).

High winds associated with strong low-pressure systems frequently affect Heceta Island. Wind speeds over 80 mph are possible during the fall and winter months. Winds are predominantly from the southeast. High rainfall and thin soils over karst topography increase windthrow risk by restricting rooting depth and stability.

Second growth is not as susceptible to wind damage as old growth (Forest Engineering Inc. 1982 p 43). Tree crowns are closer together in second growth. The crown-to-crown contact dampens the swaying motion and distributes wind throughout the stand (Stathers et al. 1994 p 4-7). This ability to resist wind damage can be lost by thinning too heavily. Some windthrow is inevitable, but good silvicultural prescriptions and unit design can minimize windthrow.

The Port Alice, Warm Chuck, and Crooked Hook 3 units are all exposed to strong southeast storm winds. Windthrow has recently occurred along edges of these stands following 11-year-old harvests in adjacent stands to the southeast of them. Wind damage in these areas resulted from an abrupt stand boundary created during the adjacent harvest. Wind damage appears to have stabilized in these areas.

Key Indicators

Indicator #1 Average tree physiological characteristics

Characteristics for this indicator tree condition are: live crown ratio, height-to-diameter ratio, stem mortality, and average diameter. These traits tend to reflect the general vigor of a stand and the ability of the stand to respond to treatments, resist weather damage, and repel insect and disease attack. A rating of high, medium or low reflects the expected general health of these stands.

Table 3-14 Stand rating values as determined by average tree characteristics

Values	Live Crown Ratio	Height-to-Diameter Ratio	Stem Mortality Per Acre Per Year	Average Diameter At Breast Height
High	More than 35%	Less than 85%	0	More than 20 inches
Medium	30-35%	85-95%	1-10	15-20 inches
Low	Less than 30%	More than 95%	More than 10	Less than 15 inches

The rating for current stand condition is based on stand exam data collected in spring 2002. Future-value projections are based on local knowledge of responses that have occurred in sites treated in similar fashions as well as predictions developed using version RV:12.19.02 of the Alaska variant of the Forest Vegetation Simulator (FVS). FVS is a growth and yield model used by all regions of the Forest Service.

Indicator #2 Herb and shrub ground cover

This is an estimate of the percentage of understory herb and shrub ground cover in the units. For analysis purposes, future value predictions are based on local knowledge of responses that occurred on sites treated in similar fashion in the mid-1980s, such as the old Naukati commercial thinning study site. Current values are based on stand exam data collected in spring of 2002. Stand exam data is contained in the project planning record.

Indicator #3 Weather Damage

Weather damage is acres of windthrow that causes obvious changes to the vegetation. For analysis purposes, future value predictions are based on local knowledge of risks and damages that have occurred in sites treated in similar fashions such as the Naukati commercial thinning study site. Current values are based on stand exam reconnaissance and aerial photo interpretation.

Indicator #4 Acres of stem-exclusion stand structure

Stem-exclusion stand structure is distinguished by the occupation of all available growing space and the restricted growth and subsequent mortality of less competitively advantaged trees in a stand (Oliver et al. 1996 pp 152-153). Large areas of stem-exclusion stand structure over the landscape are not favorable because stem exclusion causes restricted understory vegetation and decreased species diversity. After canopy closure, approximately 25 to 35 years following logging, understory productivity and biomass is rapidly lost. By stand age 40, the understory consists of little more than moss. This condition can persist until stand age 150 to 200 (Alaback et al. 1984).

ENVIRONMENTAL CONSEQUENCES

Commercial thinning removes some trees and opens "growing space" for the remaining trees and understory vegetation. The term "growing space" describes the availability of growth factors such as sunlight, water, and nutrients. Tree growth is inhibited if any growth factor is in short supply (Oliver et al. 1996 pp 36-38,). Physiological indications of limited growing space in second growth include mortality in understory plants, reduced live crowns, restricted diameter growth, and mortality of trees in intermediate and suppressed crown classes. All of the stands proposed for thinning exhibit indications of limited growing space.

The timing of a thinning operation is based on the original stocking, growth ability of the site, and the objectives of the operation. The age of the trees when thinned affects the volume and value of the stand at the end of the rotation (British Columbia Ministry of Forestry 1999 pp 10-11). Stands thinned for commercial products too early may not produce enough stems of merchantable size to be of any financial significance. On the other hand, a stand thinned too late may be susceptible to wind

and ice damage due to thin, frail boles. Additionally, older overstocked stands may have trees that lack enough live crowns remaining to be able to grow in response to the increased resources that thinning provides.

Table 3-15 Key Indicators of effects of the alternativess on silviculture

Effects Indicator	Alt. 1	Alt. 2
#1 Average value of trees by physiological characteristics	medium	high
#2 Herb and Shrub ground cover	0-25% ground cover on 90% of area	66-85% ground cover on 90% of area
#3 Weather Damage	20 acres	30 acres
#4 Acres of stem-exclusion stand structure on Heceta Island 10 years into the future	*8,739 acres	*8,339 acres

*Precommercial thinning prolongs the onset of stem exclusion structure. This acreage accounts for all previous precommercial thinnings and assumes all existing, young stands that have not been precommercially thinned, would be precommercially thinned by the time they are 25 years old.

Alternative 1

Alternative 1 would not harvest timber or study the effects of commercial thinning in the proposed second-growth stands in the project area.

There are several direct effects of this alternative:

- Shrub and forb cover would remain low for many years. Continued loss of understory vegetation would further reduce the ability and increase the time required for these plants to re-populate the area.
- Risk to wind damage would remain about the same. The high height-to-diameter ratio and associated increased risk of weather damage would continue until the stands started self-thinning. This would limit the number of suitable trees remaining.
- Crowded conditions would continue to restrict live crown growth and the related ability of the trees to respond to future treatments. Live crown ratios would continue to decrease, limiting the growth response from any future stocking reduction . This would further restrict options for treating the overstocked conditions in the future.
- Overall timber volume would be at or near the maximum for the site, however stems would average smaller diameters. When these densely stocked, unthinned stands reach maturity, the overall volume would still be high, but the trees would have a much smaller diameter (DBH) than if the stand was thinned, and therefore would be less valuable for wood production.
- Species composition would remain basically the same.

Indirect effects would include:

- The opportunity to benefit future management with knowledge gained through this project would be lost

Alternative 2

Alternative 2 would commercially thin between 25 and 50 percent of the volume on five older second-growth stands, using various thinning treatments. Forestry Sciences Laboratory would study the effects of thinning in the units.

Direct effects of this alternative:

- Thinning treatments would open the forest canopy and provide conditions more condusive to understory re-initiatiation by allowing more sunlight to reach the forest floor. There would be more nutrients available for new tree, brush and forb regeneration.
- Retaining the largest and best-formed trees would increase overall diameter and crown length. Average height-to-diameter ratios would decrease making the stands more suitable for future partial-cut prescriptions, and less susceptibale to windthrow.
- More growing space would provide additional room for live crown growth. Since live crown ratios would increase, more photosynthate would be available for diameter growth, which translates to increased windfirmness. Risk of wind damage would increase initially following thinning and then decrease as trees respond to additional light and growing space. The more stable a stand is, the more options it has for future stand treatments
- Thinning would increase the average stem diameter and potential value of these stands by retaining the largest and best formed trees. Spruce generally tends to be the larger and best formed tree species in the units and would be selected as leave trees more often than hemlock. This would result in a higher percentage of Sitka spruce in the stand and would more closely resemble the original stand composition. Spruce has higher market value and thinning these stands would increase the future value.
- The knowledge gained through implementation this project would benefit future second-growth management.

SOILS

This section provides an overview of the soil resources for the project area. A Forest-wide treatment of soil resources may be found in the Forest Plan Final EIS, Chapter 3, and the Forest Plan, Chapter 4 and Appendix I.

AFFECTED ENVIRONMENT

The soils in the project area originate from parent materials from three sources: carbonate (limestone) bedrock, conglomerate bedrock, and well-drained organic material. Soils are commonly divided into either organic or mineral soils based on the parent materials.

Mineral soils are found throughout the five project area units, with small amounts of organic soils found in the Warm Chuck and Port Alice units. Most soils in the project area are well drained and support high-volume second-growth stands of small-diameter Sitka spruce and western hemlock trees. The project area covers 18,665 acres and includes about 86 miles or 384 acres of specified roads.

The Crooked Hook units are underlain by well-drained carbonate bedrock. Deeper Ulloa soils (more than 20 inches deep) occur in the topographic lows and on the broad flat areas between hills. Shallow Sarkar soils (less than 20 inches deep) occur on the hilltops.

The Port Alice unit is located at the summit of a hill. The north half of the unit is underlain by conglomerate bedrock. The well-drained mineral soils include the Remedios (20 to 40 inches thick) and Tolstoi (less than 20 inches thick) soil series. Slopes are undulating and range from 10 to 40 percent gradient. The south half of the unit is underlain by carbonate bedrock. Sarkar and McGilvery soils occur on the hilltops and hillsides. McGilvery soils are well-drained organic soils less than 20 inches thick. Ulloa soils occur in the areas between hills.

The Warm Chuck unit is underlain by carbonate bedrock and consists of rolling hills. Ulloa soils are found in the areas between hills and Sarkar soils are found on the hillsides and hilltops. Small amounts of McGilvery soils are found along the hilltops where epikarst is well developed.

Soil Productivity

Soil productivity refers to the capability of a given type of soil to support the growth of specific plant communities (FSM 2554.03). Soil productivity is a critical element in forest ecosystems because it affects the productivity of most other forest resources. In Southeast Alaska, site productivity is primarily a function of soil drainage and soil depth (USDA Forest Service 2001 pp 42-44). Timber management activities can influence soil productivity and its related nutrient content in a number of ways. Landslides, surface erosion, logging disturbance, road construction, and rock pit excavation can cause soil displacement. Soil compaction can impair porosity and drainage, resulting in puddling and reduced productivity (Landwehr 1993 pp 9-10).

Past harvest activities on Heceta Island used minimal suspension for yarding logs. The greatest soil disturbances occurred where a number of logs were yarded down common corridors. The yarding corridors were often located in the topographic depressions where karst channels and deep glacial till were present. Soils in some corridors were scrapped down to dense glacial till or were densely compacted by the yarding activities. In some places, deep furrows were plowed into the glacial till. Karst features located in the yarding corridors were typically filled with yarding debris and sediments. Soil productivity was reduced in the depressions.

Soil removal, soil compaction, and sedimentation of karst features led to the formation of forested wetlands and ponded water in select topographic depressions. Forested wetland soils typically have lower site productivity than well-drained upland soils (USDA Forest Service 2001 pp 42-44). Soils have also been displaced by past road building activities on Heceta Island. Acres of historic soil disturbances associated with historic logging and road construction are included in Table 3-16.

Table 3-16 Existing soil condition in the project area

Historic Activity	Activity Area	Acres	% of Area
* Existing Soil Disturbance Conditions Caused From Historic Logging Activities	Proposed Units	9	2.3%
	Project Area	436	2.3%
Soil Disturbances Associated with Historic Specified Road Construction	Proposed Units	12	3.0%
	Project Area	384	2.1%
Total Existing Soil Disturbances	Proposed Units	21	5.3%
	Project Area	820	4.4%

*Soil disturbances from past logging activities are based on field observations during the karst assessment of the proposed units. Soil disturbances calculated in the units were extrapolated to estimate soil disturbances throughout the project area.

Surface Erosion

An organic mat and a dense layer of living vegetation in the project area protect the forest soils and minimize surface erosion. When the organic mat is displaced or mineral soils are exposed, surface erosion can occur. Surface erosion and sedimentation of karst features occurred in the corridors where yarding activities scraped away the protective organic mat. As part of the natural soil rebuilding process, an organic soil mat has been restored. The organic soil mat provides erosion protection for mineral soils and glacial till.

Mass Wasting

In steep, forested terrain with high water levels, mass wasting (landslide) is the dominant erosion process (Swanston 1969 p 2). Mass wasting in various forms (debris avalanches and flows, landslides, rock fall, and soil creep) is a natural process that occurs throughout the Tongass National Forest. These processes occur in both undisturbed and managed areas, and they deliver soil, rock, and debris into the aquatic environment on a recurring basis (Swanston 1974 p 2-3).

The heavy rainfall common in Southeast Alaska often triggers shallow, rapid failures that originate in mid to upper slope positions at the upper ends of drainages. Deep-seated landslides, which are larger and more infrequent, involve the failure of the bedrock underlying the soil (Swanston 1974 p 2-4). Deep-seated landslides are generally not affected by management activities.

No landslides were identified in the project area. The gentle to moderate slopes found in the project area (5 to 45 percent gradient), in combination with the internal drainage of the soils, results in a low probability of landslides.

The Forest Service uses a mass movement index (MMI) to identify potentially unstable sites. MMI 3 soils (51 to 71 percent slopes) and MMI 4 soils (over 72 percent slopes) have the highest mass movement hazard. No MMI 3 or MMI 4 soils are mapped in the project area.

ENVIRONMENTAL CONSEQUENCES

Soil Productivity

Soil disturbance is an unavoidable consequence of timber harvest and road construction. Mitigation measures are applied to reduce disturbance, however it is not possible to eliminate disturbance. Region 10 soil standards and guidelines state that a minimum of 85 percent of an area should be left in a condition of acceptable productivity potential for trees and other managed vegetation following land management activities. Activities in the project area that may lead to adverse effects on soil productivity include road construction, rock pit development, and soil disturbances caused from harvest activities such as tree felling and yarding.

The Forest Plan defines detrimental soil conditions as disturbances that include acres of temporary roads and rock pit construction, and soil disturbances larger than 100 square feet caused by management activities. It should be noted that specified and composite road construction are not counted toward detrimental soil condition. Road building activities in the project area are all classified as composite roads.

Analysis of soils displaced from road and rock pit construction assumes 4.8 acres per mile of road and one 2-acre rock pit for every 2 miles of new road construction. In addition to 2.6 miles of road construction, about 16.5 miles of existing specified road would be maintained or reconstructed. The reconstruction would enhance road surfaces and drainage structures. The road reconstruction would improve soil disturbances and erosion sites along the existing roads.

Analysis of surface disturbances includes soil displacements greater than 100 ft^2 caused by tree felling and yarding activities. This analysis assumes five percent detrimental soil condition for areas where partial suspension yarding is proposed and two percent detrimental soil condition where full suspension is proposed (Landwehr 1997; Landwehr & Nowacki 1999).

Alternative 1

Soils in the project area are considered to be in a healthy condition and are well within Forest standards for disturbance and productivity. About 4.4 percent of the soils in the project area were disturbed by past management activities including road building and harvest. Road banks are vegetated and an organic soil mat has developed over the majority of areas disturbed by past logging activities. Erosion and productivity losses associated with these disturbed areas are considered minimal across the project area.

No commercial thinning or road construction is proposed in Alternative 1. No soil productivity would be lost due to proposed commercial thinning or road construction activities.

Alternative 2

No thinning is planned on slopes exceeding 51 percent or on soils with a MMI rating of 3 or 4. The majority of the project area has slopes less than 50 percent gradient.

The intent of the Regional Soil Quality Standards is to maintain soil productivity within acceptable limits. These standards allow up to 15 percent of the productive forest land to be in a detrimental condition. The commercial thinning units would have partial harvest prescriptions, which would reduce potential effects in comparison to clear-cut harvesting. Soil displacements and other impacts to soils in

harvest units would be minor surface disturbances and would be well within the 15 percent soil quality standards.

NOTE: These soil disturbances were statistically calculated from clearcut timber harvesting on very steep slopes. Soil displacement from commercial thinning activities on the gentler slopes of this project area would be less. Soil disturbances were estimated high for this project. Calculations in Table 3-17 are based on the following figures:

- 18.665 acres in the project area
- 400 acres in the thinning units
- 11.8 acres of new composit road construction
- 11.8 acres of proposed rock pits associated with road construction
- 20 acres of soil displacement from the proposed thinning

Table 3-17 Key indicators of effects of the alternatives on soil productivity

Effects Indicator	Alt. 1	Alt. 2
Total acres of soil disturbance	0	43.6 ac
Percent of soil disturbance in thinning units	0	10.9%
Percent of soil disturbance in project area	0	0.2%
Percent of detrimental soil condition in thinning units based on Region 10 standards and guidelines	0	5.0%
Percent of detrimental soil condition in project area based on Region 10 standards and guidelines	0	0.1%

Specified and composite road construction is not counted toward detrimental soil condition according to R10 soil standards and guidelines.

Under Alternative 2, the estimated detrimental soil conditions in thinning units (5 percent) and the overall project area (0.1 percent) are estimated to be well within R10 soil standards and guidelines. These detrimental soil condition values are well below the Region 10 soil standards.

The potential exists to disturb up to 20 acres of soil resources during thinning activities, or 5 percent soil displacement for partial suspension yarding in the units. Soil disturbances are based on clear-cut harvest on steep slopes and thus have been estimated high for this commercial thinning project. Soil impacts associated with yarding are often considered minor surface disturbances where logs scrape the ground surface, remove the organic mat, and expose bare mineral soil. Disturbed organic surface horizons often begin to redevelop within several years to provide protection for erosion losses.

Road construction totaling approximately 2.6 miles is anticipated to affect 11.8 acres of soil resources. No road construction is proposed on slopes exceeding 67 percent gradient. Rock pit development may also disturb up to 11.8 acres of soil resources depending on the volume of rock needed for road construction. Road and rock pit construction are permanent displacements of soil resources. Proposed road and rock pit construction accounts for only 0.1 percent soil displacement in the project area.

TIMBER

This section provides an overview of the timber resources and economics of the project. Key indicators used to illustrate differences between the action and no action alternatives will follow a brief discussion of the previous and proposed treatments and logging systems. Key timber indicators include:

1. Knowledge Gained for Future Second Growth Management
2. Number and Size of Units
3. Estimated Timber Volume
4. Log Grades & Product Quality
5. Supply of Second Growth
6. Demand for Second Growth
7. Timber Sale Economics
8. Socio-economics

AFFECTED ENVIRONMENT

Previous and Proposed Treatments

Timber harvest and associated road construction have been conducted on Heceta Island since the 1930s. As a result, all but 2.6 miles of the road needed to implement the project are in place. In 1986, portions of the Warm Chuck stand were planned for various commercial thinning treatments under the Cone Bay Timber Sale. This plan included three thinning treatments totaling about 12 acres and one clear-cut harvest of 4 acres. Roads needed to access the sale were constructed and the 4 acres were clear-cut in 1988. This cut appears as a small rectangular exclusion on the Warm Chuck unit map (see Chapter 2 unit maps). The remaining 12 acres were never thinned because the contract was terminated for default.

This project proposes to commercially thin about 400 acres in five units on northeast Heceta Island. Areas of unthinned trees, or controls, would be necessary in order to compare the effects of treated areas to untreated areas. As a result, not all of the 400 acres would be thinned. The Forestry Sciences Laboratory (FSL) would establish thinning and control study plots among the units. The purpose of the study would be to improve the future management of second-growth on the Forest by collecting information on the effect commercial thinning has on understory and overstory development in Southeast Alaska.

The FSL study plan estimates 25 to 50 percent of the volume would be removed using various treatments within the units. Types of commercial thinning treatments may include strip thinning and various density thinnings. Strip thinning is done in alternating strips where trees are completely cut in one strip and untouched in the next. Density thinnings are accomplished by targeting a desired number of tree species and trees per acre to be retained. Tree retention is usually based on a fixed or variable spacing. An example of a fixed spacing would be spacing on a grid, where a tree is left every 20 feet (20 foot by 20 foot spacing). An example of a variable

spacing would be a basal area thinning, where the spacing is dependent on tree diameter and density.

Logging Systems

In order to have comparable results between treatment units, the FSL commercial thinning study proposes to commercially thin using the same equipment across units. Ground-based logging systems, such as shovels, excavators, or skidders are generally not suitable for areas that have Karst and soils concerns. Because of the possible compaction and soil disturbance associated with ground-based systems on thinner soils, a cable logging system would be used for this project. Cable systems are best suited for areas with soil concerns and slopes greater than 40 percent. The advantage of most cable systems is their ability to suspend logs over the ground, which can greatly minimize soil disturbance.

A skyline type of cable system is commonly used when full suspension and lateral yarding of the logs are required. Yarding is a term used for moving logs from their felled location to a landing or deck. Landings are where logs are collected and sorted, usually by species and size, then loaded onto trucks for transport to a log transfer facility (LTF) or lumber mill. A yarding corridor is a narrow path that is clear of trees and where logs are transported by cable to a landing. When partial cutting, such as in a commercial thinning, the trees are first felled toward a yarding corridor, yarded horizontally across the slope into the corridor, and then yarded up the corridor to a landing. Corridors for this project would typically be about 100 to 150 feet apart and 15- to 25-feet wide.

Logs would be hauled to the Forest Service LTF at Port Alice. Another possibility is using the Camp Cove LTF, which is located on State land. Barging logs from the Camp Cove LTF would lower the cost of hauling logs because it is located about five miles closer to all units except the Port Alice unit. The 19 miles of haul road needed for this project would require maintenance that would include road brushing and minor resurfacing. Maintenance, reconstruction and culvert repair would be required on 16.5 miles of road. About 2.6 miles of new construction would be needed to complete access into the units.

ENVIRONMENTAL CONSEQUENCES

The timber resource is affected by a number of factors, such as: wood supply for target markets (sawtimber, house logs and veneer products); stand improvement to improve future wood quality; and employment opportunities.

It is important to note that the positive socio-economics of this project actually offset the negative timber sale economics. Income generated from jobs created by this project offset the negative project net revenue.

Key Indicators

Table 3-18 compares the effects of seven indicators for Alternatives 1 and 2. Each key indicator is explained following the table.

Table 3-18 Key indicators of effects of the alternatives on timber

Key Indicator	Alt. 1	Alt. 2
Value of Knowledge Gained for Future Second-Growth Management	None	High Value
Number and Size of Units		
Number of commercial thinning units	0	5
Total Unit Acres	0	400
Estimated Volumes CCF		
CCF Before Thinning	24,894	24,894
CCF After Thinning	24,894	12,447
Log Grades and Product Quality		
Present	Grades 2 & 3 Low to Moderate Quality	Grades 2 & 3 Low to Moderate Quality
Future	Grades 2 & 3 Low to Moderate Quality	Grades 0,1,2,3 Wide Range of Quality
Supply of Second Growth		
Present	None	Low
Future	None	High
Demand for Second Growth		
Present	Low	Low
Future	Low	High
Timber Sale Economics		
Anticipated Timber Sale Bid Value	0.00	- $1,635,440.47
Total Project Costs	-255,158.40	-$628,560.93
Socio-Economics		
Direct Jobs	0	33
Direct Income from Jobs	$0.00	$1,463,624.40

Knowledge gained for managing second growth in the future

An estimated 650,000 acres of second-growth on the Tongass National Forest will reach maturity over the next 45 years (Zaborski et.al. 2001 p 5). Over 175,000 of these acres are on the Thorne Bay Ranger District. The first objective of this project is to improve future management of second growth by evaluating the effects of commercial thinning. Knowledge gained from evaluating the effects of this project and future commercial thinning projects on understory and overstory development would improve the management of second growth timber resources. This knowledge would help meet the second objective of the project, improving the health and vigor of second growth. Stands in the stem-exclusion stage generally provide the least overall benefits (Oliver et al. 1996 p 162). Thinning can advance stand conditions to meet many objectives.

- Open the forest canopy to stimulate understory growth for wildlife habitat

- Promote larger tree size by concentrating wood production from many small stems to fewer, larger stems
- Capture wood production that would otherwise be lost to mortality
- Influence forest composition by retaining desired tree species
- Generate local timber-related economic opportunities
- Increase health and vigor of stands by removing diseased and other undesirable trees
- Enhance visual quality and recreational activity

Managing second growth effectively will become more important over the next 20-50 years as past harvest stands mature (see supply and demand in this section). Commercial thinning treatments and studies will be replicated on other locations throughout Southeast Alaska in the future. Such studies will aid in future management decisions.

Knowledge gained was measured using a simple, relative scale that corresponds to how valuable the knowledge gained from this project might be for future management. Table 3-19 displays these values.

Table 3-19 Potential value of knowledge gained from this project

High Value	Knowledge gained through this proposed project would be considered highly valuable.
Moderate Value	Knowledge gained through this proposed project would be considered fairly valuable.
Low Value	Knowledge gained through this proposed project would be considered minor.
None	No new knowledge would be gained through this proposed project.

Acreages & Volumes

The five units proposed for this study include Port Alice, Warm Chuck, Crooked Hook 1, Crooked Hook 2, and Crooked Hook 3. For unit locations please see unit maps in chapter 2. Acreages were measured by a field-traverse of each unit. SUPERSTAND and NEAT modeling programs were used to estimate volumes from combined unit stand exam data. The USDA Forest Service in Southeast Alaska uses both programs. Treatments would vary in number of stems removed per treatment. For example, the control acres would have no trees removed, some areas would have 25 percent removed, and others 50 percent removed. For the purpose of this environmental assessment, the Volume After Thinning numbers in Table 3-20 assume a maximum of 50 percent total volume removal.

Table 3-20 Unit acres and volume in hundred cubic feet (CCF)

Unit Name	Acres	Existing Volume	Volume After Thinning
Port Alice	37	2,303	1,151
Warm Chuck	165	10,269	5,134
Crooked Hook 1	26	1,618	809
Crooked Hook 2	30	1,867	934
Crooked Hook 3	142	8,837	4,419
Totals	400	24,894	12,447

Log Grade & Product Quality

Tree diameter and the number and size of limbs and knots on the first 16 feet of the tree primarily affect log grade and product quality. The best average log grade that can be expected in the units is generally a #2 sawlog because of the small number and size of knots and dead limbs. The Forest requirements for a #2 grade spruce or hemlock log are: a minimum 12-inch inside bark with small end diameter. a minimum three faces with live knot or branch size 2½ inch diameter or smaller, and dead knot or branch size 1½ inch diameter or smaller. A #2 sawlog may have larger limbs if it has two surfaces with clear 6-foot lengths in each face.

About one-third of the trees in all units have at least one 16-foot #2 segment, based on the diameter constraints. Approximately 80 percent of the sawlog volume in these trees meets the knot requirements for #2 sawlogs (Dinsmore 2003 pp 2-3). Due to the lack of log grades better than #2 sawlog, it is expected that the overall current value of the stands for contemporary forest products would be much less than that of old-growth forests in the area.

The closed canopy conditions in all units are promoting self-pruning of both spruce and hemlock. Limbs on most dominant and co-dominant trees are generally dead on the lower 16 to 32 feet of the tree bole. In many cases these dead limbs have broken back to less than one foot of the tree bole. These dead limbs would eventually fall off and, after thinning, the trees would begin to put on clear wood. This would increase the tree grade and value of the stand.

The overstocked conditions that promote self-pruning also limit overall diameter growth. Left unthinned, the average diameter growth would be about 1.7 inches over the next ten years, and average stand diameter and expected growth would not produce log grades better than #2 over the next 50 years (Dinsmore 2003 pp 3).

Product quality was measured using a simple scale that corresponds to sawlog grade. Pre-cruise data from all five units was analyzed using the Alaska version of the National Cruise Program (NATCRS) to determine current log grades. Table 3-21 displays log grade, product quality, and the percent of western hemlock and Sitka spruce in the units.

Table 3-21 Sawlog grade, product quality and percent of species in the units

Sawlog Grade	Product Quality	Hemlock %	Spruce %
0 (Peeler)	Very High	4	0
1	High	8	1
2	Moderate	25	34
3	Low	58	65
7 (pulp)	Very Low	4	0
8 (cull)	None	1	0
	total	100	100

All units contain at least 80 percent low to moderate quality second growth. This quality of wood is a result of the stand age and density. When a stand is thinned, attributes of the remaining trees change. There are, however, always trade-offs associated with thinning. Some of these attribute changes are desirable; others are not.

Thinning can significantly affect species composition, stand structure, rates of growth, and the wood quality. Thinning allows the more desirable species to be retained and the removal of trees with undesirable characteristics such as disease, forks, rot, cracks and scars. These effects can have an overall positive influence on recoverable volume and lumber qualities (Christensen et al. 2001 p 84).

After thinning, stem taper increases, crowns become fuller, branches become larger and more numerous, and diameters increase. An increased crown leads to increased diameters. Larger diameters are generally very desirable because of the increased volume. However, when the crown increases, the branches also grow larger and are retained longer. Larger branches mean larger knots in the wood. This is not generally desirable, but one of the trade-offs. Thinning would accelerate stem growth, create fewer rings per inch, and increase the rate of branch occlusion. Branch occlusion is where the stem or bole overgrows the knots.

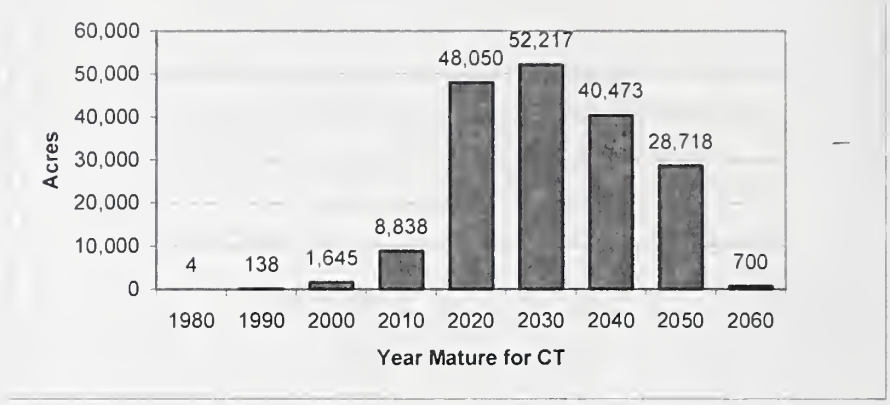
Supply and Demand

Supply - Ketchikan Pulp Company held a 50-year long-term timber contract with the Forest; which began in the 1950s and was terminated in 1997. Under the contract, stands of old growth were clear-cut and replaced by young even-aged stands of second growth. As of the year 2000, about 654,000 acres of forest in Southeast Alaska were second growth (Zaborski et.al. 2001 p 5). The number of second-growth stands on Heceta Island, Prince of Wales Island, and the surrounding areas growing into commercial thinning size are increasing. The majority of these stands will be ready for thinning between 2020 and 2050. As a result, there will be a rapidly increasing supply of small-diameter, second growth over the next 25 years.

Supply of second growth was calculated using a graph that charts by decade the acres of second growth reaching commercial thinning size. Data is from a recent GIS query of acres and the harvest year of Timber Production stands on the Thorne Bay Ranger

District. Figure 3-2 displays expected volume of second growth growing into commercial size, by decade, on the Thorne Bay Ranger District.

Figure 3-2 Acres of commercial-size second growth, Thorne Bay Ranger District



Demand - Timber demand is influenced by many factors such as:

- Interest rates
- Housing construction rates
- Value of the dollar
- Import tariffs
- Export policies
- Business cycles in the United States and overseas
- Mill capacity
- Regional and worldwide markets
- Timber availability and cost

Supply and demand for Tongass National Forest old-growth timber has been studied extensively and documented in detail. However, little information has been collected on demand for Tongass second-growth timber. Uncertainties regarding the market for small-diameter wood were raised during public scoping. While small-diameter wood is a component of many old-growth stands that have been harvested, few second-growth timber sales of small-diameter wood have been offered in Southeast Alaska. As a result, local demand for this wood has been minimal. For the past six years, the Thorne Bay Ranger District has received requests for small amounts of commercial-size second growth, primarily for log homes. However, the demand for commercial-size second-growth house logs is not expected to significantly impact the thousands of acres of second growth that will be available for the next 10 to 20 years.

Currently, the economic outlook for low-grade wood products coming from unmanaged second-growth stands is bleak (Dahlstrom and Brown 2002 p 1). Stump to market production costs on this project would be considerably higher than for similar operations in other states (Forest Engineering Inc. 1982 pp 96-110). Additional transportation and barging are the main reasons for this higher cost. This

would make it difficult for Tongass second growth to compete in the lumber market with timber from Canada and the Continental U.S. One potential way to overcome this is to provide high quality, clear wood that can command premium prices. As fewer old-growth stands are harvested in the future, the demand for clear lumber will increase (Wheeler 2002).

The one promising program that could have a significant impact upon the demand for commercial-size second-growth is peeling veneer from commercial-size second growth for interior filler for plywood and high quality veneer products. There is interest from a few parties in purchasing the Gateway Forest Products veneer-peeling lathe mill in Ketchikan. These same parties are also very interested in peeling the second-growth from Heceta Island and elsewhere.

Timber Sale Economics.

Public scoping identified concerns over the economic viability of the project. The following concerns were identified:

- The effect on project viability of costs associated with mobilization and transportation (of harvested wood to the mill).
- The effect on project viability of road costs (construction, reconstruction, maintenance, etc.)
- The effect of existing lower quality wood on project viability.

The Region 10 NEPA Economic Analysis Tool (NEAT) was used to compare the financial efficiency of the project. NEAT operates on the concept of the Transactional Evidence Appraisal system (TEA). Based on the last ten sales sold, it calculates the anticipated bid value for a mix of species and products using average logging costs, road costs, and timber values that have been adjusted for project specific characteristics. The factors used to adjust the anticipated timber sale bid value include logging costs, wood quality, and market fluctuations.

The NEAT analysis for this project also used stand exam data collected from the proposed units to calculate the number of trees per acre by diameter and species in each volume strata. Using this information, NEAT determines, by species, the average volume and value of a representative tree in each diameter class, as well as trees per acre and volume per acre harvested from the project units.

It is important to note that NEAT only analyzes for sawlog products. It does not analyze for house logs or veneer products, which have a much higher value than #2 and #3 sawlogs. NEAT was used to calculate the timber sale economics, NEPA costs and project preparations costs. Project preparation costs include sale preparation, sale administration, and engineering support. Table 3-22 displays a summary of NEAT analysis for the timber sale economics of this project.

Table 3-22 NEAT analysis of timber sale economics

Timber Sale Economics	
Anticipated Timber Sale Bid Value	- $1,635,440.47
Project Costs	
NEPA Preparation	$255,158.40
Project Preparation	$373,402.53
Total	$628,560.93

This sale could need to be subsidized if economics do not improve when it is time to implement this project. There are many ways this project could be accomplished. One way is through a service contract, where the Forest Service would pay a contractor to perform the thinning. The logs could be decked and sold later to help reduce the overall cost, or the government could include salvage rights in the contract. Another way to accomplish the project would be to form a partnership with an organization (a university for example) that would perform the work as an educational project. The Forest Service could cover costs and provide summer jobs for forestry students. A third way would be to partner with a company where the Forest Service exchanges the second growth for the thinning service. In summary, alternative ways to accomplish this project could include any of the following:

- Seek approval to offer a deficit sale if the demand for this product exists.
- Allow the export of spruce and hemlock sawlogs to make the timber more valuable to the purchaser.
- Appraise second-growth logs for veneer product to offset unfavorable economics.
- Reduce the contract expense by having the contractor deck logs on site, rather than haul & barge them to a mill. Decked logs could then be offered for bid at a later date.
- Allow milling of logs on site to reduce transportation costs.
- Use Service Contracts with salvage rights to perform the thinning operation.
- Use alternate forms of contracting, such as negotiating goods for services to implement this project.
- Use Public Works contracts to build the roads necessary to improve the economic viability of this project.

Socio-Economics.

Many scoping comments were supportive of commercial thinning. Benefits identified included jobs and a supply of wood to help maintain the timber industry. Second growth timber harvest is important to the future of communities in Southeast Alaska. Precommercial and commercial thinning second growth can help smooth timber flow by filling in projected shortages in production resulting from age class imbalances that may occur between final rotations (B.C. Ministry of Forestry 1999 pp 2).

In addition to project economic analysis, NEAT also provides information on employment and income generated by this project. Table 3-23 displays the results of NEAT analysis for the Socio-Economics of this project.

Table 3-23 NEAT analysis of socio-economics

Socio-Economics	
Logging Jobs	12
Sawmill Jobs	21
Total Jobs	33
Direct Income from Jobs	$1,463,624.40

Alternative 1

Alternative 1 would not thin timber or study the effects of commercial thinning in the proposed second-growth stands on east Heceta Island.

Direct effects associated with selecting Alternative 1:

1. The NEPA cost estimate for preparing the environmental assessment for this project is $255,158.40. This cost is incurred regardless which alternative is selected.
2. There would be no additional jobs created or income generated.

Indirect effects associated with selecting Alternative 1:

The five units would likely remain in the stem exclusion stage for another 50 to 100 years before showing significant signs of understory development and improvement to tree growth and wood quality.

The opportunity to benefit future second-growth management with knowledge gained through this project would be lost.

Alternative 2

Alternative 2 would commercially thin 25 to 50 percent of the volume in five older second-growth stands, using various thinning treatments, and study the effects of those treatments.

Direct effects associated with selecting Alternative 2:

1. The costs of preparing this environmental assessment ($255,158.40) and project preparation and administration ($373,402.53) as shown in Table 3-22.
2. The cost of implementing the thinning treatments. It is unlikely that the sale would appraise above cost, until the market rebounds and timber values substantially increase. The negative anticipated timber sale bid value shows that it is unlikely that a purchaser would bid on this sale if appraised for sawlogs. Given the importance of the thinning study, it may be necessary to subsidize the project or appraise a sale for products other than sawlogs. Timber from this project could then be made available for various products, such as house logs, veneer stock, and low-grade sawlogs would be available to the market.
3. Additional income and jobs would be generated as shown in Table 3-23.

Indirect effects associated with selecting Alternative 2:

1. The five units would be moved from the stem exclusion stage toward the understory re-initiation stage, allowing for understory development and improvement to tree growth and wood quality.
2. The opportunity to benefit future second-growth management with knowledge gained through this project.

The economic benefits (jobs and income from jobs) from this project are projected to last two or three years, depending on what is produced from the harvested timber, and where the manufacturing takes place.

TRANSPORTATION

The National Forest System Road Management Rule (Roads Rule) signed 1/3/01, amended the Forest Transportation System Manual (FSM 7700) to reflect changes in policy and terminology. The policy developed was to ensure that National Forest System Roads meet certain objectives.

- Provide for public uses.
- Provide for safe and public access and travel.
- Allow for economical and efficient management.
- To the extent practicable, begin to reverse adverse ecological impacts associated with roads.
- Meet all other current and future land and resource management objectives.

The Roads Rule included the following definitions pertaining to road management.

National Forest System Road. A classified forest road under the jurisdiction of the Forest Service. The term "National Forest System road" is synonymous with the term "forest development road" as used in 23 USC 205.

Road. A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

1. **Classified Roads**. Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1). These roads receive various levels of road maintenance, from storage, where no maintenance is required, to paved Forest highway roads.
2. **Unclassified Roads**. Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail. Roads that were once under permit or

other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1)

3. **Temporary Roads**. Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1). These roads are built to one or more timber harvest units and decommissioned after use.

Road Maintenance. The ongoing upkeep of a road that is necessary to retain or restore the road to the approved management objective (FSM 11712).

Road Reconstruction. Activity that results in improvement or realignment of an existing classified road.

AFFECTED ENVIRONMENT

Roads

Access to Heceta Island is by plane or boat. There are 86 miles of existing roads in the project area (49.9 miles of classified and 30.1 miles of unclassified). Some of the roads traverse through state lands. The roads on Heceta Island were constructed for past timber harvest and subsequent silviculture and other administrative activities. In general, the road system on Heceta Island is passable. Some old temporary roads are closed by virtue of conifer and alder growth

Table 3-24 Classified roads located in the project area

Road Number	Beginning At Road # - MP #	Length (Miles)
1400000	1445000 - MP 0.0 1446000 - MP 0.0	1.35
1445000	1400000 – MP 8.24	10.93
1445290	1445000 – MP 0.58	1.53
1445292	1445290 – MP 6.1	0.92
1445295	1445000 – MP 0.58	1.04
1445300	1445000 – MP 2.15	0.50
1445310	1445000 – MP 2.64	2.99
1445370	1445000 – MP 5.85	.50
1445385	1445000 – MP 4.37	1.23
1445392	1445385 – MP .93	.19
1445396	1445385 – MP 1.13	.11
1445400	1445000 – MP 4.62	1.44
1445480	1445000 – MP 6.28	.98
1445500	1445000 – MP 6.87	.61
1445520	1445500 – MP .01	.82

Road Number	Beginning At Road # - MP #	Length (Miles)
1445600	1445000 – MP 6.63	3.42
1445610	1445600 – MP .037	.60
1445620	1445600 – MP .038	.61
1445630	1445600 – MP 1.08	3.44
1445632	1445630 – MP 1.03	.69
1445635	1445630 – MP 3.22	.05
1445636	1445630 – MP 1.77	.28
1445638	1445630 MP 3.25	0.34
1445640	1445600 – MP 1.51	.65
1445645	1445600 – MP 1.91	.64
1445650	1445600 – MP 2.10	1.15
1445660	1445600 – MP 2.56	.63
1445670	1445600 – MP 3.11	.32
1445700	1445000 – MP 8.60	1.82
1445730	1445000 – MP 8.22	.95
1445800	1445000 – MP 9.76	.47
1445820	1445000 – MP 10.51	.38
1445830	1445000 – MP 10.93	.50
1446000	1445000 – MP 0.00	3.48
1446200	144600 – MP 1.98	.57
1446300	1446200 – MP .17	1.33
1446330	1446300 – MP .42	.70
1446360	1446300 – MP .74	.59
1446600	1446000 – MP 2.94	1.19
Total Classified Roads		49.9

Facilities

Log Transfer Facilities

There are two log transfer facilities (LTFs) in the project area. The Camp Cove (Four Mile) facility is located on State land in the project area. It has not been used for a number of years and has no existing structure except for a ramp. It may be possible to load barges at the ramp. There is no storage room near the ramp.

The Port Alice log transfer facilities were last used for the Heceta-Sawfly sale; which was completed in May 2001. That sale used barges on an existing ramp. The

sediment pond is functional. There are no bulkheads, buoys, or docks remaining in Port Alice.

Field Camp

A small dock near Camp Island is used to access the island. The Forest Service has a small camp facility near the log transfer facility at Port Alice. The camp includes water treatment and Alaska Department of Environmental Quality approved sewer treatment facilities. One small permanent building is located on a concrete slab on the site. Hookups are in place for three temporary camping trailers. This facility is used for forest management on Heceta Island.

ENVIRONMENTAL CONSEQUENCES

Table 3-25 Key indicators of effects of the alternatives on roads

Key Indicators of Effects	Alt. 1	Alt. 2
Miles of New Road Construction	0.0	2.6
Miles of road reconstruction & maintenance	0.0	16.5
Total Miles of Road in the Project Area	86.0	88.6

Note: Miles are rounded to the nearest 10^{th} .

Alternative 1

Roads

Under this alternative no new road construction would occur. There would be 86 miles of existing road in the project area. The miles of road per square mile would remain about 2.9. There would be 47 stream crossings and two rock pits from previous harvest in the project area. Some road maintenance such as road brushing and cleaning culverts that have been plugged by beaver would continue as part of routine maintenance.

Facilities

Under this alternative, there would be no direct effect on the LTF or existing field camp. No additional quarters or associated utilities improvements would be necessary. No maintenance activities would occur at the LTF site. The small permanent cabin would remain for other forest management activities regardless of which alternative is chosen.

Alternative 2

Alternative 2 would include about 2.6 miles of new classified road construction. There would be 4.5 miles of road reconstruction; which could include overlays realignment, and other backhoe work. There would be light roadwork on another 12 miles in the form of brushing and shaping of the mainline roads.

The road length in the project area would increase from 86 to 88.6 miles. Based on road density per square mile, Alternative 2 would increase by .01 mile per square mile.

Approximately 23.6 acres of ground disturbance would occur with the proposed 2.6 miles of new road construction and rock quarries. Two existing rock quarries and two

new rock quarries would be used for road construction. The quarries would be developed, used, and restored according to section 611 of the Forest Service Specifications for Construction of Roads and Bridges.

No drainage structures would be required for the new road construction. The local limestone karst topography in the area alleviates the need for obvious drainage structures. New roads constructed would remain open to traffic for future administrative needs.

Some drainage structures in the project area would receive remedial maintenance work to ensure they are working properly. This work would comply with the Clean Water Act and Forest Plan standards and guidelines and best management practices (BMPs). Opportunities also exist for remedial drainage structure maintenance outside the project area based on effective use of equipment mobilized for this project and funding availability.

Table 3-26 Miles of road that would be in each unit by alternative

Unit	Road #	Alt. 1	New Road	Alt. 2
Port Alice	1445290	1.4	0.2	1.6
Port Alice	1445297	0.0	0.1	0.1
Total Port Alice		**1.4**	**0.3**	**1.7**
Warm Chuck	1445385	1.0	0.0	1.0
Warm Chuck	1445392	0.0	0.3	0.3
Warm Chuck	1445400	0.6	0.0	0.6
Warm Chuck	1445430	0.0	0.5	0.5
Warm Chuck	1445630	3.1	0.0	3.1
Total Warm Chuck		**4.7**	**0.8**	**5.5**
Crooked Hook 1	1445500	0.2	0.0	0.2
Crooked Hook 1	1445510	0.0	0.4	0.4
Crooked Hook 1	1445513	0.0	0.1	0.1
Total Crooked Hook 1		**0.2**	**0.5**	**0.7**
Crook Hook 2	1445520	0.0	0.4	0.4
Total Crooked Hook 2		**0.0**	**0.4**	**0.4**
Crooked Hook 3	1445520	0.4	0.0	0.4
Crooked Hook 3	1445524	0.0	0.3	0.3
Crooked Hook 3	1445525	0.0	0.2	0.2
Crooked Hook 3	1445528	0.0	0.1	0.1
Total Crooked Hook 3		**0.4**	**0.6**	**1.0**
Total miles in units		**6.7**	**2.6**	**9.3**

Table 3-27 Miles of road maintenance and reconstruction on the haul route

Road Number	Miles of Road
1400000	0.2
1445000	8.2
1445290	1.4
1445385	1.0
1445400	0.6
1445500	0.2
1445520	0.7
1445600	1.1
1445630	3.1
Total miles	16.5

Facilities

Log Transfer Facilities

Some work on the Port Alice LTF would be necessary under Alternative 2. It would require basic grading of the site to ensure proper drainage and to alleviate any sediment concerns associated with operations. Unless bundle rafting was desired, there would be adequate room for some scaling and sorting near the LTF.

Field Camp

Under this alternative, the interior of the camp building would be remodeled to accommodate an increase in the number of employees associated with the project. Improvements would include a shower, new cooking facilities, and heat stove to make the cabin functional for a small field crew. The dock near Camp Island was a new installation in 2003. No maintenance should be needed in the near future. This dock is used by visitors to the island and is the only boat and floatplane tie up on the island.

WETLANDS

Wetlands are defined as "those areas that are inundated or saturated by surface water or groundwater with a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions." (40 CFR 230.41 (a) (1).

The following section provides an overview of the wetland resources of the Heceta Commercial Thinning project area. A Forest-wide treatment of wetland resources may be found in Chapter 4 of the Forest Plan.

AFFECTED ENVIRONMENT

Wetlands occupy 26.6 percent (5,003 acres) of the 18,665-acre project area. Ninety percent of the wetlands in the project area are forested wetland and forested wetland/emergent sedge wetland complex. Additional wetland types found as small inclusions across the landscape include: forested wetland/forested upland complex, emergent short sedge, emergent tall sedge, and moss muskeg.

The National Wetland Inventory (NWI) and the USDA Wetland Classification (DeMeo & Loggy 1989) were used to identify wetland types in the project area. Both inventories relay similar results for wetlands on Heceta Island. Description and classification of wetlands in this report follows the USDA Wetland Classification. Wetlands not included on the USDA Wetland Classification inventory that were identified during field reconnaissance are described in the Disturbance Created Wetlands section.

Forested Wetland (FW)

Forested wetlands (FW) cover 13 percent of the project area and comprise nearly 50 percent of all wetlands in the project area. Forested wetlands include a number of forested plant communities with hemlock, cedar, or mixed conifer overstory, and ground cover consisting largely of skunk cabbage and deer cabbage. Forested wetlands occur on poorly or very poorly drained hydric mineral or organic soils. These wetlands are most common on gently sloping hill slopes or benches and support the transfer of water to downslope resources. These wetlands function as recharge areas for groundwater and streams, and for deposition of sediment and nutrients. Forested wetlands are capable of producing commercial forest products.

Forested Wetland/Emergent Sedge Complex (FES)

Forested wetland/emergent sedge complex (FES) covers over ten percent of the project area. It comprises nearly 40 percent of all the wetlands in the project area. The forested wetland portion of this complex is described in the previous section. The emergent sedge portion of the complex includes poor fens and rich bogs on moderately deep and very poorly drained organic soils. This wetland complex is often found on lower footslopes and on broad ridgetops. These wetlands contribute water to downslope resources.

Forested Wetland/Forested Upland Complex (FIC)

The forested wetland/forested upland complex (FIC) covers less than one percent of the project area and comprises less than one percent of all wetlands in the project area. The forested wetland portion of this complex is described above. The forested upland portion of the complex typically consists of hemlock and blueberry dominated plant communities on steeper slopes or ridges where forested wetlands occur in hollows on gentler slopes. These wetlands lie at the head of the transition from upland to wetland and serve to transfer hillslope groundwater to downslope stream resources.

Emergent Short Sedge (EM)

Emergent sedge wetlands (EM) cover 1.5 percent of the project area and more than five percent of all wetland types within the project area. Emergent sedge wetlands

include poor fens and rich bogs on moderately deep and very poorly drained organic soils. This wetland is often found on lower footslopes and on broad ridgetops. These wetlands contribute water to downslope resources and are considered to have high biological and hydrological value in the project area.

Emergent Tall Sedge (MT)

Emergent tall sedge fens (MT) cover nearly one percent of the project area and more than three percent of all wetland types in the project area. Emergent tall sedge fens are characterized by a diverse community of sedges, dominated by tall sedges such as Sitka sedge, with a variety of forbs and occasional stunted trees, usually spruce or hemlock. Soils are typically deep organic muck, often with some thin layers of alluvial mineral soil material. They occur in landscape positions where they receive some runoff from adjacent slopes resulting in somewhat richer nutrient status than bogs. These wetlands function as areas for recharge of groundwater and streams, deposition and storage of sediment and nutrients, and for waterfowl and terrestrial wildlife habitat, including black bear, mink, river otter, and beaver. Some sedge fens contain beaver ponds that often provide high quality waterfowl habitat and salmon rearing habitat. These wetlands are considered to have high biological and hydrological value in the project area.

Muskeg

Muskeg (MP) or bogs cover less than one percent of the project area and comprise less than one percent of all wetlands in the project area. Muskegs are dominated by sphagnum moss with a wide variety of other plants adapted to very wet, acidic, organic soils. They typically contain shore pine and hemlock trees less than 15 feet high. This wetland type is typically made up of raised bogs as well as sloping "poor fens" and some shrub-scrub coniferous wetlands. These wetlands function as areas for recharge of groundwater and streams and for deposition and storage of sediment, and nutrients. They are a valuable source of biological and vegetative diversity. These wetlands are considered to have high biological and hydrological value in the project area.

Disturbance Created Wetlands (DCW)

Disturbance created wetlands (DCW) cover less than one percent of the project area and comprise less than one percent of all wetlands in the project area. These wetlands have the characteristics of forested wetland described above. The disturbance created wetlands are not the result of the natural environment; these wetlands were created from historic log skidding activities. Past harvest activities on Heceta Island used a method of yarding that incorporated minimal to no log suspension. Elevated soil disturbances occurred where a number of logs were yarded down common corridors. The yarding corridors were often located in the topographic depressions where karst channels and deep glacial till were present. Karst features located in the yarding corridors were typically filled with debris and sediments from the yarding disturbances. Soil removal, soil compaction, and sedimentation of karst features have lead to the formation of forested wetlands and ponded water in select topographic depressions.

Summary of Existing Conditions

Table 3-28 displays the acres and percentages of wetlands currently located throughout the project area. Affects to wetland resources because of past management activities including wetland harvested and wetland displaced by road construction are also shown.

Table 3-28 Wetland Acres, Project Area Percentages, Wetland Previously Harvested, and Wetland Displaced by Roads for the Project Area

Wetland Type	Area (acres)	Coverage In Project Area (%)	Area Previously Harvested (acres)	Wetland Displaced by Existing Roads (acres)
Forested Wetland (FW)	2462.6	13.21	402.3	26.90
Forested Wetland/Emergent Sedge Complex (FES)	1995.6	10.70	100.6	3.60
Forested Wetland/Forested Upland Complex (FIC)	46.5	0.25	30.9	0.30
Emergent Short Sedge (EM)	282.9	1.52	2.0	0.10
Emergent Tall Sedge (MT)	165.4	0.89	13.7	0.20
Muskeg (MP)	13.3	0.07	0.1	0.04
Disturbance Created Wetlands (DCW)	36.6	0.20	36.6	0.00

Numbers are based on USFS Wet-Hab and managed stands data in GIS. Upland (non-wetland) covers 13,305.4 acres and comprises 73.16 percent of the project area.

Approximately 586 acres of wetland have been previously harvested in the project area. The majority of harvest (68 percent) occurred on forested wetland when compared to all other wetland types. Avoidance and minimization of impacts on wetlands with higher biological and hydrological values (wetlands including: EM, MT, & MP) was achieved during past management activities. Furthermore, the effects of past harvest on forested wetland resources likely caused only temporary impacts to soils and site hydrology. Long-term effects (more than ten years) of the harvest activities have not adversely affected wetland resources in the project area.

Past road building activities have displaced 31.1 acres of wetland in the project area. The majority of road building has occurred on forested wetlands (26.9 acres), which comprise more than 86 percent of all wetlands displaced by roads. Avoidance and minimization of high biological and hydrological value wetlands was achieved where practicable. The wetlands displaced by roads are irretrievable and irreversible commitments of management activities.

ENVIRONMENTAL CONSEQUENCES

Executive Order 11990 and 33 CFR 323.3 (b) require federal agencies to avoid and minimize impacts on wetlands. Two alternatives have been proposed for the project. Alternative 1 is the no action alternative where no activities would be performed and existing management would continue on the project area. Alternative 2, the preferred alternative, would involve thinning on 400 acres, construction of 2.6 miles of new road, and road maintenance and reconstruction on 16.5 miles of existing specified road. Table 3-29 displays the acres of wetlands affected by the thinning activities, composite road construction, and specified road reconstruction for Alternative 2.

Alternative 1

No commercial thinning or road construction is proposed in Alternative 1. No wetlands would be affected by commercial thinning or road construction.

Alternative 2

Commercial thinning would occur on 1.6 acres of forested wetland and 36.6 acres of disturbance created wetland. The disturbance created wetland has the same characteristics as forested wetland. The commercial thinning would be beneficial to wetland hydrology, as canopy conditions would be returned to pre-harvest levels. No thinning is proposed on wetlands with high biological and hydrological value.

Composite road construction would permanently displace 0.86 acres of disturbance created wetlands. Before past harvest these wetlands did not exist. These wetlands are considered low value for biological importance and hydrologic connectivity. Proposed road construction on these disturbance created wetlands has been minimized to the extent feasible to facilitate the project.

Table 3-29 Alternative 2 effects to wetlands in the project area

Wetland Type	Commercial Thinning on Wetland (acres)	New Road Construction on Wetland (acres)	Road Reconstruction on Wetland (acres)	Total Wetland Acres Affected
Forested Wetland (FW)	1.6	0	0.36	1.96
Forested Wetland/Emergent Sedge Complex (FES)	0	0	0.50	0.50
Forested Wetland/Forested Upland Complex (FIC)	0	0	0	0
Emergent Short Sedge (EM)	0	0	0	0
Emergent Tall Sedge (MT)	0	0	0	0
Muskeg (MP)	0	0	0	0
Disturbance Created Wetlands	36.60	0.90	0	37.50
Totals	38.20	0.90	0.86	39.96

Road reconstruction would disturb less than one acre of forested wetland and forested wetland/emergent sedge complex along existing specified road. These wetlands impacts would be negligible if the existing road base is not widened.

WILDLIFE

This section provides an overview of the wildlife, old growth, and biodiversity resources of the Heceta Commercial Thinning Study. A Forest-wide treatment of these resources is found in the Forest Plan Final EIS. The key indicators for wildlife are understory plant biomass and the small mammal populations.

AFFECTED ENVIRONMENT

There are four Value Comparison Units (VCUs) in the project area, 5580, 5610, 5590, and 5700 (Project Area Map, Figure 1-2). The four VCUs are designated for timber production and meet the criteria for the inclusion of small Old-growth Reserves (OGRs) (Forest Plan Appendix K p K-2). There are 3,249 acres of State owned lands in the project area.

The project area is a mix of even-aged and two-aged forest stands harvested 50- to 70-years ago. The units are located on highly productive sites below 1,000-foot elevation, within one mile of saltwater, and on a limestone substrate. Due to habitat modification from past harvest, the forage values in the stands are low.

There is little understanding of the implications of commercial thinning on wildlife habitat in Alaska. This project provides an opportunity for professional resource managers to learn more about appropriate techniques for harvesting second growth to mitigate loss of wildlife habitat.

The project area is densely stocked spruce and hemlock stands with few shrubs or forbs. Canopy closure is more than 60 percent throughout most of the units. Plant associations are classified as western hemlock/blueberry (Vaccinium sp.) or Sitka spruce/blueberry, although the blueberry component is nearly missing.

The long-lasting stage of understory exclusion has significant implications for wildlife and other biota that depend on understory plants for forage (Walmo and Schoen 1980 p 460). Young-growth stands provide greater understory plant biomass than old-growth stands for the first 15-25 years after clearcutting (Alaback 1982 p 6). However, the young-growth stands are much less important for deer habitat in the winter (Rose 1984 p 289; Kirchhoff and Schoen 1987 p 31). A well-developed understory of shrubs and forbs and an overstory that intercepts snow are important habitat features that need to be restored in these stands to provide critical winter range for deer (Kessler 1982 pp 3-4).

Biodiversity and Old Growth

The VCUs in the project area are highly fragmented by past timber harvest. Some remnant old-growth patches remain at lower elevations; however, large continuous blocks of productive old growth (POG) are non-existent in these VCUs. Connectivity throughout the VCUs in the project area is highly fragmented. Thinning of second-growth stands may, in time, restore habitat quality for wildlife species and improve connectivity throughout the VCUs. Thinning in the Port Alice unit could create a more circular block of functioning wildlife habitat in VCU 5700. Likewise, improvement of the Crooked Hook commercial thinning units may improve shoreline-to-shoreline connectivity between VCUs 5580 and 5590. The Port Alice

and Crooked Hook units are in VCUs that meet the requirement for establishing a small old-growth reserve (VCUs 5580 and 5700). The Warm Chuck unit is in VCU 5610, which is also a designated Timber LUD; however, the medium OGR established in VCU 5610 precludes the requirement for a small OGR.

Both VCU 5580 and 5700 meet the acreage requirements for total acres and POG acres. The interagency biologist report on the old-growth habitat reserves for the Craig and Thorne Bay Ranger Districts had no recommended changes for VCU 5580. The report (page 16) did recommend some modifications to the old-growth reserve in VCU 5700. The biologists suggested changes in the boundary to better facilitate on-the-ground boundary identification as well as an increase in the deer winter range. The recommendations resulted in an overall increase of 149 acres of old growth and 63 more acres of POG than were mapped in the Forest Plan. The Heceta IDT decided not to incorporate the interagency recommended changes because the current mapped location of the OGRs meet the intent of the Forest Plan.

The Port Alice unit is in the old-growth reserve (OGR) in VCU 5700. This small area has been previously harvested and is actually an area of older second growth and not functioning as an old growth ecosystem. The second growth has regenerated into a relatively high volume, single-age stand with low structural diversity. Plant diversity is extremely low in this stand. Low light conditions under the thick forest canopy preclude growth of shrubs and forbs.

The system of reserves included in the 1997 Forest Plan is based on the old growth conservation strategy initially developed by the interagency Viable Population Committee (VPOP) in 1993, with modifications because of additional scientific information and analysis. The 1997 Forest Plan reserve system is composed of three elements.

1. All non-development Land Use Designations (LUDs) including Wilderness, Legislated LUD II, Wild River, Remote and Semi-Remote Recreation, Research Natural Area, Municipal Watershed and other LUDs that essentially maintain old growth integrity.
2. Thirty-eight large (40,000 acre minimum), 112 medium (10,000 acre minimum) and a network of 237 small (approximately 1,600 acres) mapped Habitat Conservation Areas (HCAs), allocated in part to the Old-growth Habitat LUD and in part overlapping with other LUDs. (HCAs and OGRs are the same; HCA was an early version of the OGR).
3. Full protection of all islands smaller than 1,000 acres.

The objective of small OGRs is to ensure that every large watershed will retain at least one contiguous block of old-growth forest, so that species with limited dispersal capabilities will not be isolated (USDA 1999, ROD, p. 10). The small reserves were mapped to provide temporary functional habitat for animals dispersing between large and medium reserves and to ensure that species of concern have a relatively high likelihood of occurring in each 10,000-acre watershed (Forest Plan 1997 ROD p. 32). Small OGRs should retain productive old growth (POG) over at least 8 percent of the VCU (1/2 of 16 percent of the total acres of the VCU must be productive old growth; Forest Plan Appendix K pp 1-2).

Medium reserves should be a contiguous landscape of approximately 10,000 acres; of which at least 5,000 acres must be productive old growth forest. At least 2,500 acres of the productive old growth forest should be in the high volume strata. Medium reserves shall not be greater than 8 miles from the nearest large or medium reserve across the entire forest (Forest Plan Appendix K p K-1).

The various existing models that the Forest Service usually runs, either to indicate trends in populations or habitat over time were not run for this project. One of the major assumptions when running these models is that you are starting with old growth forest habitat and altering it into something less desirable to the wildlife. This is not true for the Heceta Commercial Thinning Study.

Threatened, Endangered, and Sensitive Species

Federally Listed Species

No Federally listed threatened or endangered species would be affected by this project. Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS), under the authority of the Endangered Species Act of 1973, as amended. Species of interest are those species for which there is information indicating the species might qualify for endangered or threatened status, but for which further evaluation is needed.

The State of Alaska has an Endangered Species law, which authorizes the Commissioner of the Alaska Department of Fish and Game (ADF&G) to list Alaska endangered species. The Regional Forester can designate species occurring on National Forests as "Sensitive."

A Biological Assessment (BA) was prepared and submitted to National Marine Fisheries Service. The purpose of the assessment and the resulting documentation was to determine whether the proposed action was likely to affect endangered, threatened, or proposed species.

The effects of the proposed action were analyzed for two federally listed species, the endangered humpback whale (*Megaptera novaeangliae*) and the threatened stellar sea lion (*Eumetopias jubatus*). The NMFS determined a finding of no effect. Because of the finding, these species are not discussed here.

See the Biological Assessment/Biological Evaluation, located in the project planning record at the Thorne Bay Ranger District for more information on the whale and sea lion. No other threatened or endangered birds, mammals or plants are known to occur in the project area.

Sensitive Species

Species listed as sensitive that may occur in or near the project area are Peale's peregrine falcon (*Falco peregrinus pealei*), Queen Charlotte (northern) goshawk (*Accipiter gentilis laingi*), trumpeter swan (*Cygnus buccinator*) and osprey (*Pandion haliaetus*). The goshawk is discussed below and the other species are discussed in the Biological Evaluation (BE). The BE is a documented Forest Service review of its activities in sufficient detail to determine how a proposed action may affect any proposed, endangered, threatened, or sensitive species.

Nine sensitive plant species are known or suspected to occur in and around Prince of Wales Island. However, on Heceta Island the second growth has regenerated into relatively high volume, single-age stands with low structural diversity. Plant diversity is extremely low in these stands. Low light conditions under the thick forest canopy preclude growth of shrubs and forbs. Botanical surveys were not conducted in the Heceta second growth units however biologists with sensitive plant training did search for sensitive plants during surveys of the units. Special attention was paid to the areas of karst seeps and wetlands. None of these plant species were observed in the proposed thinning unit boundaries. More information on these plant species can be found in the BA/BE.

Queen Charlotte Goshawk

The Queen Charlotte goshawk is a raven-sized raptor associated with old-growth forests having tall trees and dense canopies. These features allow goshawks to hunt beneath the tree canopy, and to capture prey before the prey escapes into the trees or shrub layer. Home ranges are likely smaller and breeding density higher in landscapes where high quality hunting stands are more concentrated (Crocker-Bedford 1998 p 333).

Nine goshawk nests are known on Heceta Island. Eight of the known goshawk nests are located in old growth habitat. Seven nests are located at least 3.5 miles from the nearest proposed thinning stand. One nest is within 1.5 miles of the proposed Port Alice unit, 5 miles from the proposed Crooked Hook units, and 4 miles from the proposed Warm Chuck unit. Alaska Department of Fish and Game (ADF&G) radio telemetry data indicate a male goshawk was on the Crooked Hook unit in 1994 (ADF&G 1994 pp 4, 5, 13, 18, 21 and 24). In the summer of 2002, the ninth goshawk nest was discovered on Heceta Island. This nest was located in the Crooked Hook 3 unit. A letter from ADF&G dated 28 October 2002 states that the Crooked Hook nest appeared to have been inactive for at least the past 3 to 4 years (Letter to Dave Schmid from Craig Flatten, ADF&G Research Biologist). A buffer was placed around the nest. The buffer extends to old-growth habitat located nearby.

Management Indicator Species (MIS)

Management Indicator Species (MIS) are species of vertebrates and invertebrates whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements (Forest Plan p 3-351). The brown bear, mountain goat, and red squirrel are not covered in this document because they are not known to occur on Heceta Island.

Over 90 percent of bald eagle nests on the Forest, are within 500 feet of the beach (Forest Plan p 3-363). The Port Alice unit is about .5 miles from the nearest eagle nest. The road planned for this unit is almost .75 miles from the same nest. The Warm Chuck unit is about .25 miles and the road is .5 miles from the nearest nest. There is an eagle nest about .25 miles from both the road and unit for Crooked Hook 3 (Forest Service GIS layer Eagle Nest database 2003). Any planned road construction or reconstruction that would occur within one-half mile of any eagle nest would follow all current Forest Plan standards and guidelines (Forest Plan p 4-113-114).

The beach buffer protects river otter and black bear habitats (Forest Plan p 3-363). River otters concentrate along intertidal zones, the adjacent beach fringe and streamside habitats (Forest Plan p 3-364).

Suring et al. (1988 p 3) concluded that food was the limiting factor for black bear habitat capability and a variety of habitats including salmon streams, estuarine grass flats, avalanche chutes, early seral conifer stands and old growth provided food resources suggesting a moderate association with old growth (Forest Plan p 3-413).

The Vancouver Canada goose uses forested and non-forested wetlands in estuary, riparian and upland areas of the forest (Forest Plan p 3-364). Existing Forest Plan standards and guidelines protect wetlands in the estuary and riparian areas (Forest Plan; Beach and Estuary Fringe pp 4-4, 4-5; Fish pp 4-8 to 4-12; Waterfowl and Shorebird Habitat 4-115 and 4-116)

Alexander Archipelago Wolf

The Alexander Archipelago wolf is a subspecies of the gray wolf. It was selected as an MIS species because it is an important furbearer. The primary food of most wolves in Southeast Alaska is deer, although they will feed on beaver and spawning salmon when available (Person 1993 p 11). Deer habitat capability is believed to be the single most important factor that affects wolves. Restoring quality habitat for deer by increasing shrubs and forbs would increase the habitat capability for wolves.

Another important consideration for wolf conservation is the amount of mortality resulting from trapping and hunting. Under the current regulations, five wolves per person may be taken by hunting. There is no trapping limit on wolves. The trapping season on wolves is from December 1 to March 31 (ADF&G, 2003-2004).

Many studies show that wolf abundance may be inversely correlated with road density (Person et al. 1996 pp 22-23 and 25). Person et al. (1996 p 24) noted that wolf harvest rates increased sharply in wildlife analysis areas on Prince of Wales Island where road density exceeded 0.49 miles per square mile (mi/mi^2). High road densities allow human access for shooting and trapping wolves. Management of roads is an important component of a wolf conservation strategy (Mech and Karns, 1977 p 4 and 5). Person et al. (1996 p25) reported that wolf harvest doubled when the road density below 1,200-foot elevation exceeded 0.7 mi/mi^2. The 1997 Forest Plan recommends that where road access has been determined, through analysis, to significantly contribute to wolf mortality, an open road density be maintained of 0.7 to 1 mi/mi^2 (Forest Plan p 4-116).

The project area currently has 86 miles of road existing within the boundary. The current road density within the project area is about 3.0 miles per square mile.

The ADF&G reports on wolves for the years 1993-1996, 1998, 1999, and 2000 indicate stable wolf populations. The annual ADF&G for 1 July 1999 to 30 June 2002 indicates the wolf population decreased slightly (Porter 2003 p 32). The report also indicates conservation concerns stemming from long-term habitat changes, human population growth, and increased roaded access into once remote wolf habitats.

Sitka Black-tailed Deer

The Sitka black-tailed deer is an important game and subsistence species and is associated with old growth forests. Research conducted in Southeast Alaska indicates that high-volume; mature forests at lower elevations are needed to sustain deer populations during severe winters (Schoen et al. 1985 p 8; Yeo and Peek 1992 p 253). Food availability and quality are both major factors determining the nutrition of deer (Hanley et al. 1989 p10). These two factors are a critical link between forest management and the population response of deer.

The strong association between Sitka black-tailed deer and old-growth forests is related to old growth overstory structure and understory composition. Large, strong branches of mature stands intercept snow and maintain available forage (Kirchhoff and Schoen 1987 p 31). Deer populations are negatively impacted by the combination of deep-snow and winter range that has been converted to second growth. A deep snow cover in clearcuts reduces or eliminates food availability. The closed canopy second growth stands in the proposed units provide little forage in any season.

The Forest Plan estimated that deer density on Heceta Island in 1995 was 35 deer per square mile with a predicted decline to 24 deer per square mile by the year 2095 (Table 3-30). Person et al. (1996) suggested that 13 deer per square mile would reduce the risk to long-term wolf viability. This deer density is likely to support wolves and sustain the current level of harvest by humans (Forest Plan p 3-404).

Table 3-30 Deer habitat capability for Heceta wildlife analysis area 1003*

1954 Population	1995 Population	Percent Decline 1954-1995	2095 Projected Population	Projected Percent Decline 1995-2095	Projected Percent Decline 1954-2095
3,236	2,361	28%	1,625	31%	50%

*Forest Plan, Appendix 12 p. 1, to Appendix N

Marten

The American marten is an important introduced furbearer. The species is not native to Prince of Wales or outlying islands. The Forest Plan addressed the marten with specific standards and guidelines for high value marten habitat in high risk biogeographic provinces (Forest Plan p 4-118 and 4-119). Heceta Island is in Province 16, which is not a high-risk province. As a result, the marten standards and guidelines pertaining to high-risk provinces do not apply.

Marten represent a species using lower elevation old-growth habitats during the winter (the most limiting factor for marten in Southeast Alaska). Coastal habitats and riparian areas have the highest value followed by upland habitats below 1500 feet. Old-growth forest has the highest value because the trees intercept snow, provide cover and denning sites, and provide habitat for prey species used by marten (Forest Plan p 3-354).

Table 3-31 Percent of original productive old growth harvested by VCU*

VCU	POG Harvested by 1995*	POG Harvested by 2095**
5580	35%	53%
5590	41%	62%
5610	37%	49%
5700	69%	78%

Forest Plan data from *Appendix 14 and **Appendix 15 to Appendix N

Hairy Woodpecker

The hairy woodpecker was chosen as an MIS because of its preference for stands of older western hemlock and Sitka spruce, and for its association with snags (standing dead trees). Hairy woodpeckers are resident birds in Southeast Alaska. They are primary cavity excavators, and use snags and partially dead trees for nesting and foraging. Hairy woodpeckers can represent most cavity-nesting species, because they would respond similarly to proposed activities.

Brown Creeper

The brown creeper is a small bird associated with large, old trees. Large diameter trees are preferred because a bird can feed longer and capture more prey per visit. Habitats in Southeast Alaska, such as second-growth stands, are not considered suitable for brown creepers.

Red-Breasted Sapsucker

Red-breasted sapsuckers occur throughout southern Southeast Alaska in all seasons. Sapsuckers use old-growth habitats with snags. The number of sapsuckers found in an area is directly related to the number of snags. Old-growth forests provide the best snag habitat over the long-term, with the low-volume old-growth classes receiving more use than the high-volume classes (Forest Plan p 3-356 and 3-357).

Other Species

There are old, unused great blue heron (*Ardea herodias*) nests in the Port Alice unit. Any active nests discovered during the project would be buffered. Forest Plan standards and guidelines require a 600-foot windfirm buffer around active nests (Forest Plan Heron and Raptor Nest Protection p 4-116).

The Migratory Bird Treaty Act of 1918 (amended in 1936 and 1972) prohibits the taking of migratory birds, unless authorized by the Secretary of Interior. Migratory birds do not recognize political boundaries, so it was necessary to develop treaties between the United States, Great Britain, Mexico, and Japan in order to manage the resource. The law provides the primary mechanism to regulate waterfowl hunting seasons and bag limits, but its scope is not just limited to waterfowl. Over 100 species of birds migrate to Alaska to breed, nest, and fledge their young. Many of these birds fly to interior or Northern Alaska, and only pass through the project area on the way to their breeding grounds.

The Heceta Commercial Thinning project would harvest older second-growth, therefore the project may affect individual birds and their nests, but the impacts are expected to be very small. This project is not likely to adversely affect migratory land bird populations.

ENVIRONMENTAL CONSEQUENCES

The key indicators for wildlife are understory plant biomass and the small mammal populations. The plant biomass is an integral component of the FSL study. The plant biomass indicator (understory forage species) would increase because of this project, thereby increasing the habitat for wildlife species such as deer. Wolf populations would increase as deer populations increase. The small mammal populations should also increase as habitat improves. Small mammals are prey species for a variety of wildlife life including the Queen Charlotte goshawk. Small mammal trapping was done before the project and would continue to be monitored.

Table 3-32 Key indicators of effects of the alternatives on wildlife habitat

Key Indicator	Alt. 1	Alt. 2
Small mammal population	Low	Would increase as understory plant biomass increases
Understory Plant Biomass	Low	Would increase as more sunlight reaches the forest floor

Alternative 1

Biodiversity and Old-Growth

Under Alternative 1, the second growth in the project area would continue as single-age stands with low structural and plant diversity. The area would continue provide thermal cover to wildlife. The continued low light conditions under the closed canopy would preclude most shrub and forb growth. Eventually the project area would acquire old-growth characteristics. This stage of understory exclusion in Southeast Alaska persists for 100 years or longer (Alaback 1984 p 7). The highly fragmented landscape would continue to hamper connectivity in VCUs 5580 and 5700.

Federally Listed Species

Whales and sea lions would not be affected by implementing Alternative 1.

Sensitive Species

Queen Charlotte Goshawk: A multi-layer canopy and forest openings would re-establish naturally. Eventually the project area would acquire old-growth characteristics that would improve goshawk habitat. Pristine riparian, beach, and estuary habitats generally support greater prey diversity and net prey productivity. This alternative would not affect the overcrowded condition of these stands.

Management Indicator Species

The beach buffer protects most bald eagle, river otter, and black bear habitats; which are generally located within 500 feet of the beach. Stands in the beach buffer would remain overstocked with sparse undergrowth. A multi-layer canopy and forest

openings would re-establish naturally; which would improve the quality of the beach buffer for these species.

The Vancouver Canada goose uses forested and non-forested wetlands in estuary, riparian and upland areas of the forest (Forest Plan p 3-364). Existing Forest Plan standards and guidelines already protect wetlands in the estuary and riparian areas. A multi-layer canopy and forest openings would re-establish naturally; which may improve the quality of the beach buffer for these species.

There would be no change in the predicted deer habitat capability and consequently no change in the wolf habitat capability. Levels of hunting and trapping would likely remain the same.

The area would continue to provide little to no habitat suitable for Alexander Archipelago wolf, Sitka Black-tailed Deer, Marten, Hairy Woodpecker, Brown Creeper, and Red-breasted Sapsucker.

Other Species

Heron nests in the Port Alice area would not be affected because they are old and have been inactive for at least two years (letter from ADF&G to Dave Schmid). Migratory Bird Treaty Act of 1918 (amended in 1936 and 1972) prohibits the taking of migratory birds, unless authorized by the Secretary of Interior. Migratory birds do not recognize political boundaries, so it was necessary to develop treaties between the United States, Great Britain, Mexico, and Japan in order to manage the resource. The law provides the primary mechanism to regulate waterfowl hunting seasons and bag limits, but its scope is not just limited to waterfowl. Over 100 species of birds migrate from the lower 48 to Alaska to breed, nest and fledge their young. Many of these birds fly to interior or Northern Alaska, and only pass through the project area on the way to their breeding grounds. No affects are anticipated.

Alternative 2

Biodiversity and Old-Growth

Thinning second growth would restore habitat quality for many wildlife species and improve connectivity in the project area. Re-establishment of a multi-layer canopy and forest openings would improve the quality and biodiversity of these forest stands.

Old-Growth Reserves

Second growth in the Port Alice OGR LUD would be thinned under Alternative 2. The result would introduce old growth characteristics faster than waiting for old growth to evolve over time. The re-establishment of old-growth characteristics would result in increased forage habitat and prey base.

Connectivity throughout VCUs 5580 and 5700 is currently impaired by a highly fragmented landscape. Thinning of second growth stands would restore habitat quality for wildlife species and improve connectivity throughout these VCUs. Thinning the Port Alice unit would create a more circular block of functioning wildlife habitat. Thinning the Crooked Hook units would improve shoreline-to-shoreline connectivity between VCUs.

Federally Listed Species

No direct effects are anticipated on whales or sea lions from implementation of forest management activities under this alternative. Indirect effects may be associated with

the possible increased boating activity, but compliance with the Forest Service (Forest Plan p 4-88 and 89; 4-114) and NMFS regulations would mitigate any adverse effects that a small-scale project like Heceta would have.

Sensitive Species

Queen Charlotte Goshawk: Restoring the ecological balance of a forest requires a bottom up approach, where vegetation management is carried out in a way that benefits the small mammal community to provide food resources to predators. Re-establishment of a multi-layer canopy and forest openings could improve the quality of the forest for goshawk. The Forest Plan cites low prey densities as a principle factor in the relatively low density of goshawk nests in Southeast Alaska. The result of the proposed action should have a net positive affect on goshawks.

Three species of small mammals are known to occur on Heceta Island. These species are Keen's mouse (*Peromyscus keeni*), dusky shrew (*Sorex monticolus*) and the Prince of Wales flying squirrel (*Glaucomys sabrinus griseifrons*). Unharvested old growth, riparian, beach, and estuary habitats generally support greater prey diversity and net prey productivity. Under Alternative 2, portions of the beach buffer would be thinned to within 500 feet of the beach. Although very little understory exists, cover is present for small mammals in the form of remnant stumps and down rotting logs. Thinning could increase shrub and forb cover for small mammals. Small mammal populations would be monitored after the project was completed.

Management Indicator Species

The project would not have any effects on MIS that would lead toward the listing of any species. The project would not have negative effects on bald eagle, river otter, or black bear habitat. Thinning and hastening old growth habitat characteristics would improve the habitat. Any planned road construction or reconstruction that would occur within a half mile of any eagle nest would follow all current Forest Plan standards and guidelines. River otter habitat (intertidal zones, beach fringe, and streams) would be improved by thinning to restore old-growth habitat characteristics.

The 1997 Forest Plan rated the black bear as only a moderate concern for loss of old growth habitat (Suring et al. 1993). Suring et al. (1998) concluded that food was the limiting factor for black bear habitat capability and a variety of habitats including salmon streams, estuarine grass flats, avalanche chutes, early seral conifer stands, as well as old growth provided food resources suggesting a moderate association with old growth (Forest Plan p 3-413). No impacts to black bears are anticipated under Alternative 2.

The Vancouver Canada goose uses forested and non-forested wetlands in estuary, riparian and upland areas of the forest (Forest Plan p 3-364). No impacts are anticipated under Alternative 2.

Alternative 2 would result in a long-term positive effect on the populations of deer, wolf, and marten.

Wolf habitat capability is predicted to change in proportion to the change in deer habitat capability since deer are a primary prey species for wolf. Alternative 2 would result in an increase in deer habitat capability; which would be beneficial to the wolf.

Although there would be a slight increase in road density, it is only .001 mile per square mile and should not increase the probability of deer or wolf harvest.

"Critical deer winter habitat" capability in the units is expected to increase because of the proposed action. Restoration of winter habitat critical to deer in these forest stands would occur by opening the canopy and allowing sunlight to the forest floor, increasing understory diversity and spatial heterogeneity. By increasing forage potential and maintaining snow-shedding capabilities, deer populations could remain stable even in heavy snow years.

Slash left after thinning could influence deer use of an area. Slash depths in excess of 0.5 meter (about 1.6 feet) preclude use of areas (Parker et al. 1984 p 484). Monitoring the understory response to this action is important to understanding the potential of commercial thinning as a means to maintain deer and wolf populations in heavily harvested watersheds. Monitoring of the understory is included in the FSL study.

Hairy woodpecker and red-breasted sapsucker populations are low because the project area lacks an abundance of standing dead trees (snags). Thinning could create snags by tree damage that occurs along yarding corridors. This would increase habitat suitability for snag dependent species.

The project is not expected to support a high density of brown creepers because they prefer large diameter trees. The thinning of these stands to historic tree densities could improve habitat quality for brown creepers and other old-growth dependent bird species.

Other Species

The known heron nests in the Port Alice area are old and have been inactive for at least two years. No negative effects are anticipated.

The Migratory Bird Treaty Act of 1918 (amended in 1936 and 1972) prohibits the taking of migratory birds, unless authorized by the Secretary of Interior. Migratory birds do not recognize political boundaries, so it was necessary to develop treaties between the United States, Great Britain, Mexico, and Japan in order to manage the resource. The law provides the primary mechanism to regulate waterfowl hunting seasons and bag limits, but its scope is not just limited to waterfowl. Over 100 species of birds migrate from the lower 48 to Alaska to breed, nest and fledge their young. Many of these birds fly to interior or Northern Alaska, and only pass through the project area on the way to their breeding grounds.

The project would harvest older second growth and could affect individual birds and their nests, however the effects would be minimal. This project would not adversely affect migratory land bird populations.

Subsistence

Deer

Heceta Island is a popular hunting area for subsistence hunters from Craig, the largest town on Prince of Wales Island. Craig residents harvest about 34 Sitka black-tailed deer per year from Heceta Island (Turek et al. 1998). Heceta Island ranks in the top 7 of 22 wildlife analysis areas (WAAs) used by subsistence hunters from Craig. Rural hunters harvest an average of 71 deer per year and non-rural hunters harvest 58 deer

per year (Turek et al. 1998). Deer harvest figures are shown in Appendix H of the Forest Plan.

The total number of deer harvested from Heceta Island is 6.1 percent of the estimated capability of the island. Forest Plan page H-66 shows that the average number of deer taken from Heceta Island by Craig residents was 39 (for the years 1987-1995). The projected demand for deer from Heceta is 46 in 2005 and 83 in 2095.

Wolves

Alexander Archipelago wolves are a relatively isolated population of wolves that occupy southeastern Alaska and primarily prey on Sitka black-tailed deer. Sustained deer populations are imperative to the long-term health of Alexander Archipelago wolves. Increased mortality of wolves, due to heavy harvest by humans, may be related to improved accessibility to wolf habitat with extensive road building (Person et al. 1996). Under the current regulations, five wolves per person may be hunted and there is no limit on trapping between November 15 and March 15 (ADF&G, Hunting and Trapping Regulations 2002-2003).

On Prince of Wales Island, wolf pack size averages seven to nine and each wolf eats about 26 deer per year (Person et al. 1996 p 18). The Forest Plan estimated that without thinning (Forest Plan Table 3-17), deer density on Heceta Island in 1995 was 35 deer per square mile with a predicted decline to 24 deer per square mile by the year 2095. Person et al. (1996) suggested that 13 deer per square mile would reduce the risk to long-term wolf viability. This deer density is likely to support wolves and sustain the current level of harvest by humans (Forest Plan p 3-404).

Person et al. (1996 p 25) reported that wolf mortality was correlated with miles of road in wildlife analysis area. Person et al. (1996 p 25) also reported that wolf harvest doubled when road densities exceeded .7 miles per square mile. The current road density is about 3 miles per square mile. Although there is an increase in road density it is only .01 miles per square mile and should not increase the probability of deer or wolf harvest.

Alternative 1

Subsistence

The current levels of hunting and trapping would not change under Alternative 1.

Alternative 2

Subsistence

The five units thinned under Alternative 2 would result in 2.6 miles of new road construction. The overall increase in road density (.01 miles per square mile) is not expected to have an effect on the deer or wolf populations on Heceta Island. The deer habitat (availability of forage) would improve. The wolf population would increase in direct proportion to the deer numbers.

OTHER ENVIRONMENTAL CONSIDERATIONS

Land Status

Under the Alaska Statehood Act of 1959, the State of Alaska is entitled to a certain amount of Federal land. The State was allowed to identify for selection more acreage than would ultimately be conveyed to State ownership. Selected but as yet unconveyed lands in the project area are excluded from the proposed project. Other legislation granted Alaska Native corporations similar selection rights.

Land Use Plans of Other Agencies

The CEQ regulation implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of federal, State, and local land use plans, policies, and controls for the area. The major land use regulations of concern are Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA), the Coastal Zone Management Act (CZMA), and the State of Alaska's Forest Practices Act. See the "Findings and Disclosures" section of Chapter 2 for discussion of compliance with these laws. State compliance is also discussed at the end of Chapter 1. ANILCA Section 810 requirements pertain to subsistence; these are also discussed under Subsistence in the Wildlife section of this chapter.

Forest Plan Consistency

Alternative 2 for the Heceta Commercial Thinning Environmental Assessment incorporates all applicable management direction from the Forest Plan. The alternatives are fully consistent with the Forest Plan goals and objectives, standards and guidelines, and management area guidelines that apply to the project area.

Findings and Disclosures

National Forest Management Act: Alternatives 1 and 2 comply with the Forest Plan and the Alaska Regional Guide. The project incorporates appropriate Forest-wide standards, guidelines and management area prescriptions. Required interagency review and coordination is accomplished and recommendations are incorporated.

Endangered Species Act: The alternatives would not have a direct, indirect, or cumulative effect on any threatened or endangered species in or outside the project area. Consultations with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service have been conducted, and these agencies have concurred that the proposed project is not likely to affect any threatened or endangered species. A complete biological assessment is included in the planning record.

Tongass Timber Reform Act: Application of Forest Plan riparian standards and guidelines ensures that no timber harvest would occur within 100 feet of any Class I stream or any Class II stream flowing directly into a Class I stream.

National Historic Preservation Act: The Alaska Region of the Forest Service, the Alaska State Historic Preservation Office (SHPO), and the Advisory Council on

Historic Preservation programmatic agreement (Agreement # 02MU-111001-076) establishes the Section 106 review process for certain types of projects. The Forest Service may authorize project clearance after completing and documenting the analysis process for projects that contain no historic properties. Under the terms of the Programmatic Agreement, completed reports are forwarded to the SHPO annually for a programmatic review.

Alaska National Interest Lands Conservation Act (ANILCA): An ANILCA Section 810 subsistence evaluation was conducted to determine potential effects on subsistence opportunities and resources. The project would not directly or indirectly present a significant possibility of a significant restriction on subsistence uses of wildlife, fish and shellfish, marine mammals, other foods, and timber resources. This project would not restrict any documented or reported subsistence use.

Clean Water Act: Congress intended the Clean Water Act of 1972 (Public Law 92-500) as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4) to protect and improve the quality of water resources and maintain their beneficial uses. Section 313 of the Clean Water Act and Executive Order 12088 of January 23, 1987 addresses federal agency compliance and consistency with water pollution control mandates. Agencies must be consistent with requirements that apply to "any governmental entity" or private person. Compliance is to be in line with "all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution".

The Clean Water Act (Sections 208 and 319) recognized the need for control strategies for nonpoint source pollution. The National Nonpoint Source Policy (December 12, 1984), the Forest Service Nonpoint Strategy (January 29, 1985), and the USDA Nonpoint Source Water Quality Policy (December 5, 1986) provide a protection and improvement emphasis for soil and water resources and water-related beneficial uses. Soil and water conservation practices (BMPs) were recognized as primary control mechanisms for nonpoint source pollution on National Forest System lands. The Environmental Protection Agency supports this perspective in the "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987).

The Forest Service must apply Best Management Practices that are consistent with the Alaska Forest Resources and Practices Regulations to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Control Strategy (October 2000). In 1997, The State approved the BMPs in the Forest Service's Soil and Water Conservation Handbook (FSH Handbook 2509.22, October 1996) as consistent with the Alaska Forest Resources and Practices Regulations. This Handbook is incorporated into the Tongass Land Management Plan.

A discharge of dredge or fill material from normal silviculture activities such as harvesting for the production of forest products is exempt from Section 404 permitting requirements in waters of the United States, including wetlands (404(f)(1)(A). Forest roads qualify for this exemption only if they are constructed and maintained in accordance with best management practices to assure that flow and circulation patterns and chemical and biological characteristics of the waters are not impaired (404)(f)(1)(E). The BMPs that must be followed are specified in 33 CFR

323.4(a). These specific BMPs have been incorporated into the Forest Service's Soil and Water Conservation Handbook under BMP 12.5.

Clean Air Act: Emissions anticipated from implementing either action alternative would be of short duration and would not be expected to exceed State of Alaska ambient air quality standards (18 AAC 50).

Coastal Zone Management Act: Under the Coastal Zone Management Act (CZMA) of 1972, as amended, Forest Service activities and development projects that affect the coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the Alaska Coastal Management Program (ACMP). Such "consistency determinations" are made by the Forest Service, and are reviewed by the State of Alaska as required by the CZMA.

Under the Alaska Forest Resources and Practices Act (AFRPA) of 1979 (as amended), Forest Service timber harvest projects satisfy the CZMA consistency requirement if the Forest Plan and all related standards and guidelines applicable to the project provide no less resource protection than the AFRPA requires for timber harvest projects on State land, except that the AFRPA specifies a different minimum riparian standard for Federal projects than for State projects.

The Forest Service has found the Heceta Commercial Thinning EA to be consistent with the CZMA and is currently seeking concurrence from the State of Alaska.

Executive Order 11988: Executive Order 11988 directs Federal agencies to take action to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains. The Heceta Commercial Thinning EA proposes to use existing roads and developments; no additional crossings or developments would be located within floodplains. Therefore, no adverse effects to floodplains would be anticipated with the implementation of this project.

Executive Order 11990: Executive Order 11990 requires Federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the destruction or modification of wetlands. Soil moisture regimes and vegetation on some wetlands may be altered in some harvest units; however, the affected wetlands would meet and function as wetlands within the ecosystem. Please see the Wetlands section of this chapter.

Executive Order 12898: Implementation of this project would not cause disproportionate adverse human health or environmental effects to minority or low-income populations.

Executive Order 12962: No significant adverse effects to freshwater or marine resources would occur with implementation of this project.

Civil Rights, Women, and Minorities: There would be no adverse impacts on civil rights, women, or minorities because of implementation of any of the alternatives. We have no indication, nor have any comments been received, that would lead us to believe that the proposed project would affect any individual's civil rights. This conclusion tiers to the Economic and Social Environments Analysis included in Chapter 3 of the Forest Plan.

Chapter 4

Lists

LIST OF PREPARERS

Interdisciplinary team leaders for this project are Chuck Klee and Dennis Sylvia. This is a list of the current interdisciplinary team members who prepared the Heceta Commercial Thinning Study Environmental Assessment.

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Associate Science Degree, LCC, Longview, WA, 1977
B.S. Geology, Washington State University, 1980
M.S. Geology, Washington State University, 1982
Forest Geologist, Tongass NF, Ketchikan, 9 years
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B.S. Environmental Biology, Greenville College, Greenville, IL 1998
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April 1985, Wildlife Volunteer, Tongass NF, Ketchikan, AK. 1 year
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Archaeologist, Tongass NF, 2 yr
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Archaeology, seasonal field crew, various companies, universities, and agencies, 10 yr
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Small Sales Officer, Tongass NF, Thorne Bay RD, 4 years
Silviculturist, Tongass NF, Thorne Bay AK, 6 years
Forestry Technician, Tongass NF, Thorne Bay RD, 1 years
Forestry Technician, Tahoe NF, Nevada City RD, 1 years
Forestry Technician, Mendocino NF, Covelo RD, 2 years
Forestry Technician, Klamath NF, Oak Knoll RD, 1 years

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Engineering Technician, Ketchikan Misty Ranger District 3 years
Engineering Technician, Ketchikan Supervisors Office 7 years
Engineering Technician, Thorne Bay Ranger District 1 year
Logging Engineer, Kluckwan Forest Products 1.5 years
Regeneration Forester, Quinault Indian Nation 1 year
Private forest products business owner 6 years
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Forest Engineer, Scott Paper Company 1 year

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LITERATURE CITED

Ackerman, Robert E., Kenneth C. Reid, James D. Gallison, and Mark E. Roe 1985. *Archaeology of Heceta Island: A Survey of 16 Timber Harvest Units in the Tongass National Forest, Southeastern Alaska.* Center for Northwest Archaeology, Washington State University.

Alaback, P.B. 1982. Dynamics of understory biomass in Sitka spruce-western hemlock forests of southeast Alaska. *Ecology* 63: 1932-1948. Page 6 and 1938.

Alaback, Paul B. 1984. *Plant succession following logging in the Sitka spruce-western hemlock forests of Southeast Alaska: Implications for management.* Portland, OR, United States Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, General Technical Report PNW-173.

Alaback, Paul B., John C. Tappeiner, 1984. *Response of Understory Vegetation to Thinning in the Sitka Spruce-Western Hemlock Forests of Southeastern Alaska.* Cooperative Study with U.S. Forest Service Forest, Sciences Laboratory, Department of Forest Science, Oregon State University, Corvalis, OR.

Alaska Department of Fish and Game (ADF&G). 2001. *Operational Plan: Coho Salmon Escapement and Production from Warm Chuck Lake, Southeast Alaska.* Unpublished document.

Alaska Department of Fish and Game (ADF&G). 2002. Correspondence (E-mail), Warm Chuck Coho numbers.

Alaska Department of Fish and Game (ADF&G). 2003. Correspondence (E-mail), Warm Chuck Coho numbers.

Alaska Department of Fish and Game, et al. 1998. *Essential Fish Habitat Assessment Report for the Salmon Fisheries in the EEZ off the Coast of Alaska.*North pacific Fishery Management Council, Anchorage AK

Alaska Department of Fish and Game. 1994. Unpublished goshawk data. Ketchikan, Alaska. Page 4 and 5; 13, 18, 21 and 24.

Alaska Department of Fish and Game. *2003-2004 Alaska Hunting and Trapping Regulations.* 2003. Juneau, Alaska.

Arndt, Katherine L., Russell H. Sackett, and James A. Ketz 1987, *A Cultural Resource Overview of the Tongass National Forest, Alaska.* Final Report submitted to the Tongass National Forest under contract No. 53-0109-6-00203. April 1987.

Baichtal, J.F.; and D.N. Swanston. 1996. *Karst Landscapes and Associated Resources: A Resource Assessment.* Gen Tech Rpt, PNW-GTR-383. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 13p.

Baichtal, J.F.; and Landwehr, D.J. 2001. *Heceta Commercial Thinning Opportunities, Karst and Soils Resource Report.* Unpublished manuscript, USDA, Tongass National Forest, Ketchikan Area, Thorne Bay Ranger District.

Bilby, Robert, E., Sullivan, Kathleen., Stanley, Duncan, H., 1989. The Generation and Fate of Road-Surface Sediment in Forested Watersheds in Southwestern Washington. *Forest Science.* Vol. 35. No. 2. pp 453-468.

British Columbia Ministry of Forestry, 1999, *Guidelines for Commercial Thinning*, Province of British Columbia, Victoria BC

Burton, Timothy A. 1997, Effects of Basin-Scale Timber Harvest on Water Yield and Peak Streamflow, *Journal of American Water Resources Association*, V. 33, No. 6, pg 1187

Campbell, Chris Rabich 1980, *Known and Potential Cultural Resources on Heceta and Adjacent Islands, Prince of Wales Archipelago, Southeast Alaska.* Heritage Report of the Ketchikan Area, Tongass National Forest.

Christensen, Glenn A., Kent R. Julin, Robert J. Ross and Susan Willits. 2001. *Volume recovery, grade yield, and properties of lumber from young-growth Sitka spruce and western hemlock in southeast Alaska.* PNW, Portland, OR 29 pp.

Crocker-Bedford, D.C. 1998. The value of demographic and habitat studies in determining the status of northern goshawks (*Accipiter gentilis atricapillus*) with special reference to Crocker-Bedford (1990) and Kennedy (1997). *The Journal of Raptor Research* 32: 329-336. Page 333.

Dalhstrom, Kirk, and Brian Brown, 2002. Meeting notes between the Forest Service and Kirk Dahlstrom of Viking Lumber and Brian Brown of ITT Ranier.

Deal, Robert L, Tappeiner, John C II. 2001. The Effects of Partial Cutting on Stand Structure and Growth of Western Hemlock-Sitka Spruce Stands in Southeast Alaska. *Forest Eccology and Management.*

DeMars, Donald J. 2000. *Stand-denisty Study of Spruce-hemlock Stands in Southeast Alaska.* General Technical Report. PNW-GTR-496. Portland, OR: USDA Forest Service, Pacific Northwest Research Station.

DeMeo Tom, Jon Martin, Randolph A.West, 1992, *Forest Plant Association Management Guide*, USDA Forest Service, Alaska Region, R10-MB-210

DeMeo, T. E., D Loggy, 1989. *Identification, Classification, and Delineation of Wetlands Using Soils and Vegetation Data.* Ketchikan Area, Tongass National Forest. Final Report for Tongass Land Management Plan. January 1989.

Dinsmore, Ken, 2003. Unpublished results *Heceta Commercial Thinning Project Volume Estimator, Log Grade and Defect Study*, USDA Forest Service.

Duncan, Sally. 1999. Alternatives to Clearcutting of Old Growth in Southeast Alaska. PNW *Science Findings, Issue 19.* Portland Or: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

National Oceanic and Atmospheric Administration, 2002 50 CFR Part 600 Magnuson-Stevens Act Provisions; Essential Fish Habitat (EFH). Federal Register, Vol. 67, No. 12, Thursday, January 17, 2002, Rules and Regulations.

Federal Register. Volume 67, No. 12. Thursday, January 17, 2003. Rules and Regulations.

Fifield, Terence 1996, *Cultural Resource Investigations for the Heceta Sawfly Salvage Timber Sale, Heceta Island, Southeast Alaska.* USDA Forest Service, Tongass National Forest, CRM Report 1996-05-01.

Forest Engineering Inc. for USDA Forest Service 1982, *Alaska Silvicultural Analysis, Commercial Thinning Task 03*, Forest Engineering Inc., Corvallis Oregon

Griffiths, P.A., Aley, T., Jones, W. K., Worthington, S. R. H. 2002. *Karst Management Standards and Implementation Review, Final Report of the Karst Panel.* Prepared for USDA Forest Service, Tongass National Forest, and Submitted to MWH (Montgomery Watson Harza) under the terms of USDA Contract 53-0116-2-55901, 36 pp.

Julin, Kent R, David V D'Amore. *Tree Growth on Forested Wetlands Following Clearcutting in Southeastern Alaska.* Submitted to the Western Journal of Applied Forestry.

Hanley, Thomas A., Robbins, Charles T., and Spalinger, Donald E. *Forest habitats and the nutritional ecology of Sitka balck-tailed deer: A research synthesis with implications for forest management.* March 1989. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-230. Page 10.

Harr, Dennis, R. 1980. *Effects of Timber Harvest on Streamflow in the Rain-Dominated Portion of the Pacific Northwest.* USDA Forest Service.

Harris, A. S. 1989. *Wind in the Forests of Southeast Alaska and Guides for Reducing Damage.* Gen. Tech. Rep. PNW-GTR-244. Portland OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. pp 27-31.

Harris, Arland S., W.A.Farr, 1974, *The Forest Ecosystem of Southeast Alaska*, USDA Forest Service General Technical Report PNW-25, PNW Forest and Range Experiment Station, Portland Oregon.

Helms, John A., 1998, *The Dictionary of Forestry*, Society of American Foresters, Bethesda, MD.

Hennon, Paul E, Michael McClellan, Patricia Palkovic. [In press] *Comparing Deterioration and Ecosystem Function of Decay-resistant and Decay-susceptible Species of Dead Trees.* In: Shea, P, ed. Symposium on the ecology and management of dead wood in western forests. Reno, NV. Nov. 2-4, 1999. en. Tech Rep. GTR-PSW-###. Berkeley, CA: The Wildlife Society and USDA Forest Service, Pacific Southwest Research Station.

Hennon, Paul E, Dustin T Wittwer, John Stevens, Ken Kilborn. 2000. Pattern of Deterioration and Reovery of Wood From Dead Yellow-cedar in Southeast Alaska. *Western Journal of Applied Forestry.* 5: 49-58.

Hicks, Mary V. 1997. *Wolf* Federal Aid in Wildlife Restoration Management Report Survey-Inventory Activities 1 July 1993 – 30 June 1996. Alaska Department of Fish and Game, Division of Wildlife Conservation

Jones, Stanley, H., and Fahl, Charles, B. 1994. *Magnitude and Frequency of Floods in Alaska and Conterminous Basins of Canada.* US Geological Survey. Water-Resources Investigations Report 93-4179.

Kahklen, K., and Hartsog, B. 1999. *Results of Road Erosion Studies on the Tongass National Forest.* Unpublished Report. On file with:USDA Forest Service, Pacific Northwest Research Station, Forestry Sciences Library, 2770 Sherwood Lane, Suite 200, Juneau, Ak 99801.

Keppler, Elizabeth, T. and Ziemer, Robert.R. 1990. Logging Effects on Streamflow: Water Yield and Summer Low Flows at Caspar Creek in Northwestern California, *Water Resources Research*, V. 26, No. 7, pg 1669

Kessler, Winifred. 1982. *Management Potentials of Second-Growth Forest For Wildlife Objectives in Southeast Alaska.* U.S.D.A. Forest Service, Unpublished document 110. Juneau, AK. 36 pp. Page 3 and 4.

Kirchhoff, M. and Schoen, J.W. 1987. Forest cover and snow: Implications for deer habitat in southeast Alaska. *Journal of Wildlife Management* 51(1): 28-33. Page 31.

Landwehr, D. J., G Nowacki. 1999. *Statistical Review of Soil Disturbance Transect Data Collected on the Ketchikan Area, Tongass National Forest.* Unpublished Monitoring Report. February, 1999.

Landwehr, D.J. 1993. *Final Monitoring Report. Soil Disturbance on the 89-94 KPC Long-term Sale Area. Comparisons between Gentle and Steep Slopes, Yarding Systems, and Administrative Areas. Cumulative Analysis of 1990, 1991, and 1992 Data.* Ketchikan Area Watershed Group. Unpublished Monitoring Report. February 1993. pp 9-10.

Landwehr, D.J. 1997. *Final Monitoring Report. Soil Disturbance on the 89-94 KPC Long-term Sale Area. Slopes Greater than 75 percent gradient.* Ketchikan Area Watershed Group. Unpublished Monitoring Report. January 1997.

Maas, K.M., Bittenbender, P.E., and Still, J.C., 1995, *Mineral Investigations in the Ketchikan Mining District, Southeastern Alaska.* U.S. Bureau of Mines. OFR 11-95.

Maas, K.M., Still, J.C., and Bittenbender, P.E. 1992, *Mineral Investigations in the Ketchikan Mining District, Alaska, 1991: Prince of Wales Island and Vicinity.* U.S. Bureau of Mines. OFR 81-92.

McClellan, Michael H, Douglas N Swanston, Paul E Hennon, Robert L Deal, Toni L Santo, Mark S Wipfli. 2000. *Alternatives to Clearcutting in the Old-growth Forests of Southeast Alaska: Study Plan and Establishment Report.* Gen. Tech. Rep. PNW-GTR-494. Portland, OR: USDA Forest Service, Pacific Northwest Research Station.

Mech, L.D. and P.H. Karns. 1977. *Role of the wolf in a deer decline in the Superior National Forest.* USDA Forest Service Research Paper NC-52, North Central Forest Experiment Station, St. Paul, Minnesota. Page 4 and 5.

Mech, L.D., Fritts, S.H., Radde, G.L., and Paul, W.J. 1988. *Wolf distribution and road density in Minnesota.* Wildlife Society Bulletin 16: 85-87.

Meehan, William, R. 1970. *Some Effects of Shade Cover on Stream Temperature in Southeast Alaska.* USDA Forest Service Research Note. PNW-113.

North Pacific Fishery Management Council (NPMC). *Essential Fish Habitat Assessment Report for the Salmon Fisheries in the EEZ off the Coast of Alaska.* March 31. 1998.

Nowacki, Gregory, J and Kramer, Marc, G. 1998. *The Effects of Wind Disturbance on Temperate Rain Forest Structure and Dynamics of Southeast Alaska.* General Technical Report, PNW-GTR-421, 25 pp.

Oliver Chadwick D., B.C. Larson, 1996, *Forest Stand Dynamics.* Pages 148-149. John Wiley and Sons, New York, NY

Parker, K.L., Robbins, C.T., and Hanley, T.L. 1984. Energy expenditures for locomotion by mule deer and elk. *Journal of Wildlife Management* 48(2): 474-488. Page 484.

Patric, J. H. 1966. Rainfall Interception by Mature Coniferous Forests of Southeast Alaska. *Journal of Soil and Water Conservation.* November-December 1966.

Person, David K., Kirchhoff, Mathew, Van Ballenberghe, Iverson, George C., and Grossman, Edward. 1996. *The Alexander Archipelago Wolf: A Conservation Assesment.* USDA Forest Service, Pacific Northwest Research Station.

Person, David. 1993. *Ecology of the Alexander Archipelago wolf and responses to habitat change, Progress report No. 2.* November 22, 1993. Page 11.

Peterson, Charles E. 2000. *Long-term Studies Yielding Key Scientific Information for Active Forest Management.* Misc. Pub. Portland OR: USDA Forest Service, Pacific Northwest Research Station.

Rose, Cathy L. 1984. *Response of deer to forest succession on Annette Island, southeastern Alaska.* USDA Forest Service, Forestry Sciences Laboratory. Page 289.

Ruth Robert H., A.S. Harris, 1979, *Management of western hemlock and Sitka Spruce Forests for Timber Production*, USDA Forest Service General Technical Report PNW-88, PNW Forest And Range Experiment Station, Portland Oregon

Schoen, John W., Kirchhoff, Matthew D., and Thomas, Michael H. 1985. *Seasonal distribution and habitat use by Sitka black-tailed deer in southeastern Alaska.* Juneau, AK, Alaska Department of Fish and Game. Final Report, Federal Aid in Wildlife Restoration, Project W-17-11, W-21-1, W-21-2, W-22-2, W-22-3, and W-22-4, Job 2.6R. Page 8.

State of Alaska, Dept. of Natural Resourses, Division of Forestry, 2000, *5-Year Timber Sale Plan*).

Stathers R.J., T.P. Rollerson, S.J. Mitchell, 1994, *Windthrow Handbook for British Columbia* Forests *Working Paper #9401*, British Columbia Ministry of Forestry, Victoria, British Columbia

Stednick, John, D. 1996. Monitoring The Effects of Timber Harvest on Annual Water Yield. *Journal of Hydrology*, V. 176 pg 79

Suring, L.H., Crocker-Bedford, D.C., Flynn, R.W., Hale, C.S., Iverson, G.C., Kirchhoff, M.D., Schenck II, T.E., Shea, L.C. and Titus,K. *A Propsed Strategy for Maintaining Well_Distributed, Viable Populations of Wildlife Associated with Old Growth Forest in Southeast Alaska.* Review Draft. Report of Interagency Committee. Unpub. Juneau, AK. Ref. R-116.

Suring, Lowell H., DeGayner, Eugene J., Flynn, Rodney W McCarthy, T.M., and Orme, M.L. 1988. *Habitat Capability Model for Black Bear in Southeast Alaska.* USDA Forest Service. Draft. 33 pp. Ref. 8716.

Suring, Lowell H., DeGayner, Eugene J., Flynn, Rodney W., Kirchhoff, Mathew D., Schoen John W., and Shea, Lana C. 1992. *Habitat Capability Model for Sitka Black-Tailed Deer in Southeast Alaska: Winter Habitat.* USDA Forest Service

Swanston, D. N. 1969. *Mass Wasting in Coastal Alaska*, PNW, U.S.D.A. Institute of Northern Forestry, Juneau, AK. pp. 2.

Swanston, D. N., W. Walkotten. 1969. *The Effectiveness of Rooting as a Factor of Shear Strength in the Karta Soil.* Progress Report. Pacific Northwest Forest and Range Experiment Station, USDA FS-PNW-1604:26, Juneau, AK.pp 13.

Swanston, D. N. 1974. *The Forest Ecosystem of Southeast Alaska, 5. Soil Mass Movement*, Pacific Northwest Forest and Range Experiment Station, U.S.D.A. Portland, OR. pp 2-4.

Swanston, D. N. 1980. *Influence of Forest and Rangeland Management on Anadromous Fish Habitat in Western North America.* Pacific Northwest Forest and Range Experiment Station, U.S.D.A. FS-PNW-104, Portland, OR. pp 14-17.

Swanston, D. N. 1989. *A preliminary analysis of landslide response to timber management in southeast Alaska : an extended abstract.* Proceedings of Watershed '89 : a conference on the stewardship of soil, air, and water resources : Juneau, Alaska, March 21-23, 1989. Juneau, Alaska : USDA, Forest Service, Alaska Region.

USDA Forest Service. 2001. *Aquatic Habitat Management Handbook.* R10 Amendment 2090.21-2001-1.

USDA Forest Service. 2001. *Ketchikan Area Soil Survey Users Guide.* Tongass National Forest. Ketchikan, AK.

USDA Forest Service. 2003. *Heceta Commercial Thinning Fisheries Resource Report.* Unpublished document.

USDA Forest Service. 1996. *Soil and Water Conservation Handbook* (R10-FSH 2509.22).

USDA Forest Service. 1997. *Tongass National Forest Land and Resource Management Plan.*

USDA Forest Service. 1997. *Tongass National Forest Land and Resource Management Plan Record of Decision.*

USDA Forest Service. 1997. *Tongass National Forest Land and Resource Management Plan, Final EIS*

USDA Forest Service. 2003. Forest Service GIS layer Eagle database.

USDA Forest Service. 2003. *Tongass National Forest Annual Monitoring and Evaluation Report 2002.*

USDA Forest Service. *Region 10 Landscape Management Handbook*

USDA Handbook No. 462. *National Forest Landscape Management*, Vol 2, Ch 1, The Visual Management System.

USGS, Alaska. 2000. *Hydrologic Unit Codes for State of Alaska.*

Wallmo, O.C. and Schoen, J.W. 1980. Responses of deer to secondary forest succession in southeast Alaska. *Forest Science* 26: 448-462. Page 460.

Wang, Xiping, Robert J Ross, Michael H McClellan, R James Barbour, John R Erickson, John W Forsman, Gary D McGinnis. 2000. *Strength and Stiffness Assessment of Standing Trees Using a Nondestructive Stress Wave Technique.* Res. Pap. FPL-RP-585. Madison WI: USDA Forest Service, Forest Products Laboratory.

Wemple, Beverly, C., Jones, Julia, A., and Grant, Gorden E. *1996 Channel Network Extension by Logging Roads in Two Basins, Western Cascades, Oregon.* Water Resources Association V. 32, No. 6 pg. 1195

Wenger, Karl F., 1984, *Forestry Handbook*, John Wiley and Sons, New York, NY.

Wheeler, Dr. Robert, 2002. Presentation notes, USDA Tongass National Forest 2002 Annual Silvicuture Conference

White, W.B., DC Culver, JS Herman, TC Kane, JE Mylroie. 1995. Karst Lands, *American Scientist*, V. 83, pp. 450-495.

Yeo, J.J. and Peek, J.M. 1992. Habitat selection by female Sitka black-tailed deer in logged forests of southeastern Alaska. *Journal of Wildlife Management* 56(2): 253-261. Page 253.

Zaborske, Richard R., R.N. Hauver, M.H. McClellen, T.A. Hanley, 2001. *Understory Vegetation Development Following Commercial Thinning in Southeast Alaska: Preliminary Results from the Second-Growth Management Area Demonstration Project*, 2001 National Silvicutural Workshop Proceedings, November 2001.

Ziemer, R. R., D. Swanston. 1977. *Root Strength Changes After Logging in Southeast Alaska.* Pacific Northwest Forest and Range Experiment Station, PNW-306. U.S.D.A. Forest Service, Portland, OR. pp. 8-9.

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GLOSSARY

abiotic- Non-living. Climate is an abiotic component of ecosystems.

access management- Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands (physical attributes).

adfluvial fish- Species of populations of fish that do not go to sea, but live in lakes and enter streams to spawn.

affected environment- The current conditions of any given area. The resources for the affected environment are analyzed any time a project is proposed.

age class- An age grouping of trees according to an interval of years, usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1-20 years or 21-40 years.

Alaska National Interest Lands Conservation Act (ANILCA)- Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. The Alaska National Interest Lands Conservation Act of December 2, 1980. Public Law 96-487, 96th Congress, 94 Stat. 2371-2551. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)- Public Law 92-203, 92nd Congress, 85 Stat. 2371-2551. Approved December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

allowable sale quantity (ASQ)- The amount of timber that may be sold within a certain time period from an area of suitable land. The suitability of the land and the time period are specified in the Forest Plan.

alluvial fan- A cone-shaped deposit of organic and mineral material made by a stream where it runs out onto a level plain or meets a slower stream.

anadromous fish- Species of fish that mature in the sea and migrate into streams to spawn.

ASQ – see allowable sale quantity

background- The distant part of a landscape. The seen or viewed area located from 3 or 5 miles to infinity from the viewer. (See also "Foreground" and "Middleground.")

basal area- The area of the cross section of a tree trunk near its base, usually 4 and 1/2 feet above the ground. Basal area is a way to measure how much of a site is occupied by trees. The term basal area is often used to describe the collective basal area of trees per acre.

best management practice (BMP) – Practices determined to be the most effective and practicable means of controlling pollutants at levels compatible with environmental quality goals. BMPs were conceptualized in the 1972 FUS Federal Water Pollution Control Act. BMPs as defined in the USDA Forest Service Soil and Water Conservation Handbook are mandated for use in Region 10 under the Tongass Timber Reform Act.

biological diversity- The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems, and the ecological processes that connect everything in a common environment.

biotic- Living. Green plants and soil microorganisms are biotic components of ecosystems.

blowdown- see windthrow

BMP – see best management practices

board foot- A measurement term for lumber or timber. It is the amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.

bole- The trunk of a tree.

browse- Twigs, leaves, and young shoots of trees and shrubs that animals eat. Browse is often used to refer to the shrubs eaten by big game, such as elk and deer.

buffer- A land area that is designated to block or absorb unwanted impacts to the area beyond the buffer. For example buffer strips along a trail could block views that may be undesirable.

cable logging- Logging that involves the transport of logs from stump to collection points by means of suspended steel cables. Cable logging reduces the need for the construction of logging roads.

canopy- The part of any stand of trees represented by the tree crowns. It usually refers to the uppermost layer of foliage, but it can be use to describe lower layers in a multi-storied forest.

capability- An evaluation of a resource's inherent potential for use.

cavity- A hole in a tree often used by wildlife species, usually birds, for nesting, roosting, and reproduction.

CCF- one hundred cubic feet

clearcut- A harvest in which all or almost all of the trees are removed in one cutting.

Code of Federal Regulations (CFR)- A codification of the general and permanent rules published in the *Federal Register* by the executive departments and agencies of the federal government.

colluvium - A general term applied to any loose, heterogeneous, and incoherent mass of soil material and/or rock fragments deposited by rainwash, sheetwash, or slow continuous downslope creep, usually collecting at the base of gentle slopes or hillsides.

composition- What an ecosystem is composed of. Composition could include water, minerals, trees, snags, wildlife, soil, microorganisms, and plant species.

conifer- A tree that produces cones, such as a pine, spruce, or fir tree.

connectivity (of habitats)- The linkage of similar but separated vegetation stands by patches, corridors, or "stepping stones" of like vegetation. This term can also refer to the degree to which similar habitats are linked.

corridor- Elements of the landscape that connect similar areas. Streamside vegetation may create a corridor of willows and hardwoods between meadows where wildlife feed.

cover- Any feature that conceals wildlife or fish. Cover may be dead or live vegetation, boulders, or undercut streambanks. Animals use cover to rest, feed, and escape from predators.

critical habitat- Areas designated for the survival and recovery of federally listed threatened or endangered species.

crown height- The distance from the ground to the base of the crown of a tree.

cubic foot (CF)- Equivalent to a cube of wood with 1-foot sides. The cubic foot volume is a measure of the total sound wood in a tree and is a more accurate depiction of wood volume than the board foot measure.

cultural resource- The remains of sites, structures, or objects used by people in the past; this can be historical or pre-historic.

cumulative effects - Effects on the environment that result from separate, individual actions that, collectively, become significant over time.

decision criteria- The rules and standards used to evaluate alternatives to a proposed action on National Forest land. Decision criteria are designed to help a decision maker identify a preferred choice from the array of alternatives.

decking area- A site where logs are collected after they are cut and before they are taken to the landing area where they are loaded for transport.

deer winter range- Locations that provide food and shelter for Sitka black-tail deer under moderately severe to severe winter conditions.

desired future condition- Land or resource conditions that are expected to result if goals and objectives are fully achieved.

detrimental soil condition - The condition where established threshold values of R10 soil standards and guidelines are exceeded and may result in significant change or impairment to long-term soil productivity. Specified and composite roads are not counted toward detrimental soil condition under R10 soil standards and guidelines.

developed recreation- Recreation that requires facilities that, in turn, result in concentrated use of the area. For example, skiing requires ski lifts, parking lots, buildings, and roads. Campgrounds require roads, picnic tables, and toilet facilities.

diameter at breast height (DBH)- The diameter of a tree 4 and 1/2 feet above the ground on the uphill side of the tree.

dispersed recreation- Recreation such as backpacking and scenic driving that occurs outside of developed recreation sites.

disturbance- An event such as forest fire or insect infestation that alters the structure, composition, or functions of an ecosystem.

draft environmental impact statement (DEIS)- A statement of environmental effects for a major federal action that is released to the public and other agencies for comment and review prior to a final management decision. Required by Section 102 of the National Environmental Policy Act (NEPA).

eagle nest tree buffer zone- A 330-foot radius around eagle nest trees established in an agreement between the U.S. Fish and Wildlife Service and the Forest Service.

early forest succession- The biotic (or life) community that develops immediately following the removal or destruction of vegetation in an area. For instance, grasses may be the first plants to grow in an area that was burned.

ecological approach- An approach to natural resource management that considers the relationships among all organisms, including humans, and their environment.

ecology- The interrelationships of living things to one another and the environment, or the study of these interrelationships.

ecosystem- An arrangement of living and non-living things and the forces that move among them. Living things include plants and animals. Non-living parts of ecosystems may be rocks and minerals. Weather and wildfire are two of the forces that act within ecosystems.

ecosystem management- An ecological approach to natural resource management to assure productive, healthy ecosystems by blending social, economic, physical, and biological needs and values

edge- The margin where two or more vegetation patches meet, such as a meadow opening next to a stand of trees.

effects- Effects, impacts, and consequences as used in this environmental impact statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social, and may be direct, indirect, or cumulative.

1. *Direct effects: Results of an action occurring when and where the action takes place.*

2. *Indirect effects: Results of an action occurring at a location other than where the action takes place and or later in time, but in the reasonably foreseeable future.*
3. *Cumulative effects: Effects on the environment that result from separate, individual actions that, collectively, become significant over time.*

element (of ecosystems)- An identifiable component, process, or condition of an ecosystem.

endangered species- A plant or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.

endemic plant or organism- A plant or animal that occurs naturally in a certain region and whose distribution is relatively limited geographically.

environmental analysis- An analysis of alternative actions and their predictable long and short-term environmental effects. Environmental analyses include physical, biological, social, and economic factors.

environmental assessment- A generally shorter version of an environmental impact statement. (See Environmental Impact Statement.)

environmental impact statement (EIS) - A statement of environmental effects of a proposed action and alternatives to it. The EIS is released to other agencies and the public for comment and review.

ephemeral streams- Streams that flow only as the direct result of rainfall or snowmelt. They have no permanent flow.

epikarst- the upper surface of karst, consisting of a network of intersecting fissures and cavities that collect and transport surface water and nutrients underground; epikarst depth can range from a few centimeters to tens of meters.

erosion- The wearing away of the land surface by wind or water.

estuary- For this document, estuary refers to the relatively flat, intertidal, and upland areas generally found at the heads of bays and mouths of streams. Predominantly mud and grass flats, an estuary is non-forested except for scattered trees.

evapotranspiration- Combined term for the water lost as vapor from soil or open water surfaces (evaporation) and water lost from the surface of a plant (transpiration).

even-aged management- Timber management such as clear cutting or burning that results in the creation of stands of trees that are essentially the same age.

executive order- An order or regulation issued by the President or some administrative authority under his or her direction.

fauna-The animal life of an area.

felling- Cutting down trees.

final cut- The removal of the last seed bearers or shelter trees after regeneration of new trees has been established in a stand being managed under the shelterwood system of silviculture.

final environmental impact statement (FEIS)- The final version of the statement of environmental effects required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the Draft Environmental Impact Statement (DEIS) to include public and agency responses to the draft. The decision maker chooses which alternative to select from the FEIS, and subsequently issues a Record of Decision (ROD).

fiscal year (FY)- October 1 through September 30; e.g., October 1, 1992, through September 30, 1993 = FY 93.

fisheries habitat- Streams, lakes, and reservoirs that support fish, or have the potential to support fish.

floodplain- A lowland adjoining a watercourse. At a minimum, the area is subject to a 1% or greater chance of flooding in a given year.

flora- The plant life of an area.

fluvial- Of or pertaining to streams and rivers.

forage- All browse and non-woody plants that are eaten by wildife and livestock.

forb- A broadleaf plant that has little or no woody material in it.

foreground- The part of a scene or landscape that is nearest to the viewer. The foreground is located less than 1/4 mile from the viewer. See also "Background" and "Middleground."

forest cover type- See cover type.

forest health- A measure of the robustness of forest ecosystems. Aspects of forest health include biological diversity; soil, air, and water productivity; natural disturbances; and the capacity of the forest to provide a sustaining flow of goods and services for people.

Forest roads and trails- Roads and trails under the jurisdiction of the Forest Service.

Forest Supervisor- The official responsible for administering National Forest lands on an administrative unit, usually one or more National Forests. The Forest Supervisor reports to the Regional Forester.

fragmentation- The splitting or isolating of patches of similar habitat, typically forest cover, but including other types of habitat. Habitat can be fragmented naturally or from forest management activities, such as clearcut logging.

function- All the processes within an ecosystem through which the elements interact, such as succession, the food chain, fire, weather, and the hydrologic cycle.

game species- Any species of wildlife or fish that is harvested according to prescribed limits and seasons.

geographic information system (GIS)- An information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps

geomorphic processes- Processes changing the form of the earth, such as volcanic activity, running water, or glacial action.

geomorphology- The study of the forms of the land surface and the processes producing them. Also the study of the underlying rocks or parent materials and the landforms present that were formed in geological time.

GIS- see geographic information system

ground water- The supply of fresh water under the earth's surface in an aquifer or in the soil.

group selection- A method of tree harvest in which trees are removed periodically in small groups. This silvicultural treatment results in small openings that form mosaics of age class groups in the forest.

habitat capability- The ability of a land area or plant community to support a given species of wildlife.

habitat diversity- A number of different types of wildlife habitat within a given area.

habitat diversity index- A measure of improvement in habitat diversity.

habitat- The area where a plant or animal lives and grows under natural conditions.

habitat type- A way to classify land area . A habitat type can support certain climax vegetation, both tree and undergrowth species. Habitat typing can indicate the biological potential of a site.

hydrologic cycle- The process where water evaporates, condenses, falls as precipitation, and returns to the ocean as run-off.

hydrology- The science dealing with the study of water on the land, in the soil and underlying rocks, and in the atmosphere.

indicator species- A plant or animal species related to a particular kind of environment. Its presence indicates that specific habitat conditions are also present.

indigenous (species)- Native to a given land or water area by natural occurrence.

individual tree selection- see single tree selection

instream flow- The quantity of water necessary to meet seasonal stream flow requirements to accomplish the purposes of the National Forests, including, but not limited to fisheries, visual quality, and recreational opportunities.

interdisciplinary team- A team of individuals with skills from different disciplines that focuses on the same task or project.

intermediate cut- The removal of trees from a stand sometime between the beginning or formation of the stand and the regeneration cut. Types of intermediate cuts include thinning, release, and improvement cuttings.

intermittent stream- A stream that flows only at certain times of the year when it receives water from streams or from some surface source, such as melting snow.

irretrievable- One of the categories of effects mentioned in the National Environmental Policy Act (40 CFR 1502.16) to include in discussions of the environmental consequences of management activities. Irretrievable commitments apply to the loss of production, harvest or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while the area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible because if the use changes, it is possible to resume timber production.

irreversible- One of the categories of effects mentioned in the National Environmental Policy Act (40 CFR 1502.16) to include in discussions of the environmental consequences of management activities. Irreversible commitments describe a loss of future options. Irreversible applies primarily to the effects of use of nonrenewable resources such as mineral extraction or destruction of a cultural resource site. Once these resources are gone, they cannot be replaced. Irreversible can also apply to factors such as soil productivity that are renewable only over long periods of time.

karst- Karst is a region made up of porous limestone containing deep fissures and sinkholes and characterized by underground caves and streams.

key indicators- Quantifiable measures for determining the environmental effects of an action (alternative) on a resource.

Land and Resource Management Plan - Also called the Forest Plan, this document guides the management of a particular National Forest and establishes management standards and guidelines for all lands of that National Forest.

land use designation (LUD) – An area of the Forest is assigned to one of 19 different land use designations that describe the attributes and resource conditions that the area should be managed for.

land use planning- The process of organizing the use of lands and their resources to best meet people's needs over time, according to the land's capabilities.

landing- Any place where cut timber is assembled for further transport from the timber sale area.

landscape- A large land area composed of interacting ecosystems that are repeated due to factors such as geology,

soils, climate, and human impacts. Landscapes are often used for coarse grain analysis.

large woody debris (LWD)- Any large piece of relatively stable woody material having a diameter of at least 4 inches and a length greater than 3 feet that intrudes into the stream channel.

late forest succession- The stage of forest succession in which most of the trees are mature or over mature.

log transfer facility (LTF)- A facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft. It is wholly or partially constructed in waters of the United States, and its location and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed "terminal transfer facility" or "log dump."

logging residue (slash)- The residue left on the ground after timber cutting. It includes unused logs, uprooted stumps, broken branches, bark, and leaves. Certain amounts of slash provide important ecosystem roles, such as soil protection, nutrient cycling, and wildlife habitat.

logging systems- The equipment configuration employed for yarding logs; that is, moving them from the stump to the "landing," the point on a road at which they are loaded on trucks for transportation from the unit. Logging systems fall into the following main categories, in order of increasing cost:

1. *Ground-based systems: These employ mobile machines that travel throughout the unit to skid or swing logs to the landing. Tractor logging, employing wheeled or tracked tractors or "skidders" to "skid" logs, is widely used in the South 48 but rarely on the Tongass because of the wet or rocky soils. Much more common in Southeast Alaska is shovel logging, in which a log loader or "shovel" moves logs from the stump to the landing by repeatedly swinging them closer. Shovel logging has relatively low site impacts since the machine typically makes only one pass over a piece of ground to reposition itself. On wet sites, impacts can be largely mitigated by having the machine build a pad of slash upon which to travel. Ground systems can be used to log partial cuts or clearcuts on flat or moderate terrain.*
2. *Cable systems: These employ a stationary "yarder" at the landing; that is, a set of winches powering wire rope cables that travel through the top of an integrally mounted steel tower. The cables move logs to the landing, lifting them partly or completely clear of the ground through the lift provided by the tower. Because the equipment is stationary at the landing, and does not travel on the unit, site impacts are limited to soil and stream disturbance caused by dragging the logs. "Full suspension," where the log is lifted completely clear of the ground, may be feasible, in which case these impacts are absent. "Partial suspension," in which one end of the log is lifted clear of the ground while the other end drags on the ground, is more readily achievable. Cable systems may be employed on any terrain, with different systems being adapted to different site conditions.*
3. *Highlead: A simple cable yarding system, using a two-drum yarder to provide lift to the front end of the logs. "Grabinski" is a modified highlead cable system capable of enhanced lift. Highlead is capable of clearcut logging, but not partial cuts.*
4. *Skyline: The various skyline systems employ an additional cable or "skyline" to impart additional lift to the logs. Site impacts are therefore reduced. The system common in southeast Alaska is the "running skyline," which is typically highly mobile. It is capable of logging clearcuts and, in certain conditions, partial cuts. The "slackline" is typically less mobile, but with greater distance capabilities and with the capability to "sideblock" logs from out to the side of the skyline. It is thus usually applied in the more difficult terrain. It is capable of yarding clearcuts and, for some equipment configurations and site conditions, partial cuts. The "shotgun" or "gravity return" system is restricted to uphill yarding. It can log clearcuts and, in some equipment configurations, partial cuts.*
5. *Cold-deck and swing: An obsolete system once widely employed in Alaska, whereby a highlead yarder assembled a "cold-deck" or pile of logs for subsequent transportation by skyline to the landing.*
6. *A-frame: Now also obsolete, this system employed a yarder mounted on a raft to yard logs into a bay or lake.*
7. *Multispan skyline: An intermediate support spar is rigged to lift the skyline clear of topographical obstacles. This system has found very little application in old-growth timber but may prove more practical in future second growth thinning operations.*
8. *Aerial logging systems: Systems where the cut logs are moved from the stump to the landing without touching the ground. The only such system practical for the Alaska operating environment is helicopter logging, which employs a heavy-lift helicopter for yarding. Typically the maximum practical helicopter yarding distance is 5,000 feet; additionally, the flight path cannot exceed 40 percent downhill or 30 percent uphill, and a relatively large landing of approximately one acre is required. Helicopter*

logging is capable of logging any silvicultural prescription.

losing stream- A stream that either flows into the groundwater system through its bed or flows directly into a karst feature.

LUD – see land use designation

MBF- thousand board feet (see board feet.)

MMBF- million board feet (see board feet.)

management action- Any activity undertaken as part of the administration of the National Forest.

management indicator species (MIS)- A wildlife species whose population will indicate the health of the ecosystem in which it lives and, consequently, the effects of forest management activities to that ecosystem. MIS species are selected by land management agencies. (See "indicator species".)

marine and estuarine province- Open ocean overlying the continental shelf and adjacent areas of coastlines that are influenced by tidal activity.

mass movement or mass wasting- The down-slope movement of large masses of earth material by the force of gravity. Also called a landslide.

mature timber- Trees that have attained full development, especially height, and are in full seed production.

McGilvery (soil series)- Soil series composed of a thin surface layer (less than 8 inches deep) of organic material overlying bedrock. These soils are associated with cliffs and rock outcrops and are sensitive to disturbance.

mean annual increment of growth- The total increase in size or volume of individual trees. Or, it can refer to the increase in size and volume of a stand of trees at a particular age, divided by that age in years.

memorandum of understanding (MOU)- A legal agreement between the Forest Service and others agencies resulting from consultation between agencies that states specific measures the agencies will follow to accomplish a large or complex project.

middleground- The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the landscape; area located from 1/4 mile to 5 miles from the viewer. See also "Foreground" and "Background."

mineral soil- Soil that consists mainly of inorganic material, such as weathered rock, rather than organic matter.

MIS – see management indicator species

mitigation- Actions taken to avoid, minimize, or rectify the impact of a land management activities.

mixed stand- A stand consisting of two or more tree species.

model- A representation of reality used to describe, analyze, or understand a particular concept. A model may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. A model has limits to its effectiveness and is used as one of several tools to analyze a problem.

monitoring and evaluation- The periodic evaluation of forest management activities to determine how well objectives were met and how management practices should be adjusted.

moraine - A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice, in a variety of topographic landforms that are independent of control by the surface on which the drift lies.

mortality- Trees that were merchantable and have died within a specified period of time. The term mortality can also refer to the rate of death of a species in a given population or community.

multiple-aged stands- An intermediate form of stand structure between even and uneven-aged stands. These stands generally have two or three distinct tree canopy levels occurring within a single stand.

multiple-use management- The management of all the various renewable surface resources of National Forest lands for a variety of purposes such as recreation, range, timber, wildlife and fish habitat, and watershed.

muskeg- In Southeast Alaska, a type of bog that has developed over thousands of years in depressions or flat areas on gentle to steep slopes. Also called peatlands.

National Environmental Policy Act (NEPA) - Congress passed NEPA in 1969 to encourage productive and enjoyable harmony between people and their environment. One of the major tenets of NEPA is its emphasis on public disclosure of possible environmental effects of any major action on public lands. Section 102 of NEPA requires a statement of possible environmental effects to be released to the public and other agencies for review and comment.

National Forest Management Act (NFMA)- A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of regional guides and forest plans and the preparation of regulations to guide that development.

National Forest recreation sites (NFRS)- National Forest recreation sites that have been inventoried.

natural disturbance- See disturbance.

natural range of variability- See range of variability

natural resource- A feature of the natural environment that is of value in serving human needs.

nest survey- A way to estimate the size of a bird population by counting the number of nests in a given area.

net sawlog volume- Tree or log volume suitable in size and quality to be processed into lumber. In Southeast Alaska,

depending on the market, the volume may be processed as pulp or lumber.

no action alternative- The most likely condition expected to exist in the future if management practices continue unchanged.

non-commercial vegetative treatment- The removal of trees for reasons other than timber production.

non-consumptive use- The use of a resource that does not reduce the supply. For instance, bird watching is a non-consumptive use of wildlife. Boating and fishing are non-consumptive uses of water.

nongame- Wildlife species that are not hunted for sport.

nonpoint source pollution- Pollution whose source is not specific in location. The sources of the discharge are dispersed, not well defined, or constant. Rainstorms and snowmelt often make this type of pollution worse. Examples include sediments from logging activities and runoff from agricultural chemicals.

non-renewable resource- A resource whose total quantity does not increase measurably over time, so that each use of the resource diminishes the supply.

notice of intent (NOI)- A notice printed in the *Federal Register* announcing that an Environmental Impact Statement will be prepared. The NOI must describe the proposed action and possible alternatives, describe the agency's proposed scoping process, and provide a contact person for further information.

old growth- Old forests often containing several canopy layers, variety in tree sizes and species, decadent old trees, and standing and dead woody material.

old-growth reserve (OGR)- A contiguous unit of old-growth habitat to be managed to maintain the integrity of the old-growth forest ecosystem.

organic soil- Soil at least partly derived from living matter, such as decayed plant material.

over mature timber- Trees that have attained full development, particularly in height, and are declining in vigor, health, and soundness.

overstory- The upper canopy layer; the plants below comprise the understory.

parent material- The mineral or organic matter from which the upper layers of soil are formed.

partial cut- Method of harvesting trees where any number of live stems are left standing in any of various spatial patterns. This does not include clearcutting. Can include seed tree, shelterwood, or other methods.

partial retention- A visual quality objective which, in general, means man's activities may be evident but must remain subordinate to the characteristic landscape.

patch- An area of homogeneous vegetation, in structure and composition.

patch cut- A clearcut that creates small openings in a stand of trees, usually between 15 and 40 acres in size. Patchcuts are used to provide the disturbance needed to regenerate other trees or plants.

percolation- Downward flow or infiltration of water through the pores or spaces of rock or soil.

perennial stream- A stream that flows throughout the year and from source to mouth.

personal use- The use of a forest product, such as firewood, for home use and not for commercial use.

planning area- The area of National Forest land covered by a Regional Guide or Forest Plan.

planning period- The 50 year time frame for which goods, services, and effects were projected in the development of the Forest Plan.

plant association - A potential natural plant community of definite floristic composition and uniform appearance. (FSM 2060.)

plant community - A group of one or more populations of plants in a common spatial arrangement. (FSM 2060)

PNV- see present net value.

pole timber- Trees between 5 and 9 inches in diameter at breast height.

pole or sapling- The stage of forest succession where trees are between 3 and 7 inches in diameter and are the dominant vegetation.

population viability- Ability of a species to sustain itself.

precommercial thinning- Removing some of the trees from a stand that are too small to be sold for lumber or house logs, so the remaining trees will grow faster.

predator- An animal that lives by preying on other animals. Predators are at or near the tops of food chains.

prescription- Management practices selected to accomplish specific land and resource management objectives.

present net value (PNV), also called present net worth- The measure of the economic value of a project when costs and revenues occur in different time periods. Future revenues and costs are "discounted " to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable than dollars in the future. PNV is used to compare project alternatives that have different cost and revenue flows.

presuppression- Activities carried out in advance of fire occurrence to ensure effective suppression when the need arises.

primitive ROS (Recreation Opportunity Spectrum)- A classification of wilderness and recreation opportunity. It is

characterized by an essentially unmodified environment, where trails may be present but structures are rare, and where it is highly probable to be isolated from the sights and sounds of people. (See ROS.)

productive- The ability of an area to provide goods and services and to sustain ecological values.

Productive Old Growth (POG)- Old-growth stands capable of producing 20 cubic feet per acre per year with 8,000 or more board feet per acre.

public involvement- The use of appropriate procedures to inform the public, obtain early and continuing public participation, and consider the views of interested parties in planning and decision making.

public land- Land for which title and control rests with a government - Federal, state, regional, county, or municipal.

ranger district- The administrative sub-unit of a National Forest that is supervised by a District Ranger who reports directly to the Forest Supervisor.

raptor- A bird of prey, such as a eagle or hawk.

recharge- The addition of water to ground water by natural or artificial processes.

record of decision (ROD)- An official document in which a deciding official states the chosen activity (alternative) that will be implemented from a prepared EIS.

Recreation Opportunity Spectrum (ROS) - The land classification system that categorizes land by its setting and the probable recreation experiences and activities it affords.

regeneration- The renewal of a tree crop by either natural or artificial means. The term is also used to refer to the young crop itself.

release cutting- Removal of competing vegetation to allow desired tree species to grow.

removal cut- The removal of the last seed bearers or shelter trees after regeneration is established.

reserve areas- Areas reserved from harvest (no cutting) in perpetuity or for one rotation (2054). Such areas are deferred from harvest at this time to reduce cumulative effects or to meet specific Forest Plan Standards and Guidelines. Reserves lasting in perpetuity are in areas that became unsuitable following reconnaissance of the originally planned harvest unit (e.g., high-vulnerability karst, RMAs, MMI 4 soils). Reserves lasting until the end of the rotation are in areas of suitable land in the original planned units (e.g., additional buffers that are greater than RMA or karst minimum requirements, buffers placed on Class III or IV streams). These areas are available for future harvest, but have been deferred from harvest for one rotation.

reserve trees- Merchantable or submerchantable trees and snags that are left within the harvest unit to provide biological habitat components over the next management cycle.

residual stand- The trees remaining standing after an event such as selection cutting.

Resource Planning Act (RPA) assessment and program- The RPA Assessment is prepared every 10 years and describes the potential of the nation's forests and rangelands to provide a sustained flow of goods and services. The RPA Program is prepared every 5 years to chart the long-term course of Forest Service management of the National Forests, assistance to state and private landowners, and research. They are prepared in response to Sections 3 and 4 of the Forest and Rangeland Renewable Resources Planning Act of 1974 (16 U.S.C. 1601).

responsible official- The Forest Service employee who has been delegated the authority to carry out a specific planning action.

revegetation- The re-establishment and development of a plant cover by either natural or artificial means, such as re-seeding.

riparian area- The area along a watercourse or around a lake or pond.

riparian ecosystem- The ecosystems around or next to water areas that support unique vegetation and animal communities as a result of the influence of water.

riparian management area (RMA)- The area including water, land, and plants adjacent to perennial streams, lakes, and other bodies of water that is managed for the inherent qualities of the riparian ecosystem.

roads- A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

9. *Classified Roads. Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1). These roads receive various levels of road maintenance, from storage, where no maintenance is required, to paved Forest highway roads.*
10. *Unclassified Roads. Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1)*
11. *Temporary Roads. Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the*

forest transportation system and not necessary for long-term resource management (36 CFR 212.1). These Roads are built to one or more timber harvest units and decommissioned after use.

ROD- see record of decision

ROS- see recreation opportunity spectrum.

rotation- The number of years required to establish and grow timber crops to a specified condition of maturity.

run-off- The portion of precipitation that flows over the land surface or in open channels.

sapling- A loose term for a young tree more than a few feet tall and an inch or so in diameter that is typically growing vigorously.

sawtimber (sawlog)- Trees that are 9 inches in diameter at breast height or larger that can be made into lumber.

scale- In ecosystem management, it refers to the degree of resolution at which ecosystems are observed and measured.

scoping- The ongoing process to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations, or letters.

second growth- Forest growth that was established after some kind of interference with the previous forest crop, such as cutting, fire, or insect attack.

selective cutting- A system in which groups of trees or individual trees are removed periodically from the forest based on economic criteria aimed at maximizing logging revenues rather than the need to ensure satisfactory regeneration or to maintain stand growth rates and quality of timber production. The term is often used synonymously with selection cutting, but this is seldom correct because the management goals of the two systems differ. Selective cutting provides periodic revenues from the forest but is not specifically designed to improve the growing conditions of the trees remaining. The practice of selective cutting has historically resulted in the selection of the biggest and best trees for cutting, leaving behind damaged trees and degraded ecosystem functions.

sensitive species- Plant or animal species that are susceptible to habitat changes or impacts from activities. The official designation is made by the USDA Forest Service at the Regional level and is not part of the designation of Threatened or Endangered Species made by the US Fish and Wildlife Service.

sensitivity level- A map inventory that measures people's concern for the scenic quality of the National Forests. In 1980, the Tongass National Forest assigned sensitivity levels to land areas viewed from anchorages, plane and boat routes, roads, trails, public-use areas, and recreation cabins.

12. *Level I: Includes all seen areas from primary travel routes, use areas, and water bodies where at least three-fourths of the Forest visitors have a major concern for scenic quality.*
13. *Level II: Includes all seen areas from primary travel routes, use areas, and water bodies where at least one-fourth of the Forest visitors have a major concern for scenic quality.*
14. Level III: *Includes all seen areas form secondary travel routes, use areas, and water bodies where less than one-fourth of the Forest visitors have a major concern for scenic quality.*

seral- The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession.

shelterwood- A cutting method used in a more or less mature stand, designed to establish a new crop under the protection of the old.

silviculture- The art and science that promotes the growth of single trees and the forest as a biological unit.

silvicultural system- The cultivation of forests; the result is a forest of a distinct form. Silvicultural systems are classified according to harvest and regeneration methods and the type of forest that results.

single tree selection (STS)- The removal of individual trees from certain size and age classes over an entire stand area. Regeneration is mainly natural, and an uneven aged stand is maintained.

site index- A measure of the relative productive capacity of an area for growing wood. Measurement of site index is based on height of the dominant trees in a stand at a given age.

site preparation- The general term for removing unwanted vegetation, slash, roots, and stones from a site before reforestation. Naturally occurring wildfire, as well as prescribed fire can prepare a site for natural regeneration.

size class- One of the three intervals of tree stem diameters used to classify timber in the Forest Plan data base. The size classes are: Seedling/Sapling (less than 5 inches in diameter); Pole Timber (5 to 7 inches in diameter); Sawtimber (greater than 7 inches in diameter)

skidding- Hauling logs by sliding, not on wheels, from stump to a collection point. Skidding forms skid trails.

skyline logging- A logging system used to remove timber from steep slopes. Logs are brought up-slope on a suspended cable, or skyline. Since the weight of the log is completely or partially supported by the cable, there is little disturbance to soil or other vegetation.

slash- The residue left on the ground after timber cutting or left after a storm, fire, or other event. Slash includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, etc.

slump- A landslide where the underlying rock masses tilt back as they slide from a cliff or escarpment.

small game- Birds and small animals normally hunted or trapped.

snag- A standing dead tree. Snags are important as habitat for a variety of wildlife species and their prey.

soil compaction- The reduction of soil volume. For instance, the weight of heavy equipment on soils can compact the soil and thereby change it in some ways, such as in its ability to absorb water.

soil productivity- The capacity of a soil to produce a specific crop. Productivity depends on adequate moisture and soil nutrients, as well as favorable climate.

special use permit- A permit issued to an individual or group by the USDA Forest Service for use of National Forest land for a special purpose. Examples might be a Boy Scout Jamboree or a mountain bike race.

split yarding- The process of separating the direction of timber harvest yarding into opposite directions.

stand- A group of trees that occupies a specific area and is similar in condition.

standards and guidelines- Requirements found in a Forest Plan which impose limits on natural resource management activities, generally for environmental protection. Forest Plan standards must be met; while guidelines direct the conditions that management should strive for.

State Historic Preservation Office (SHPO)- State office that administers federal and state programs for cultural resources. The Forest seeks concurrence from SHPO for all NEPA projects.

stewardship- Caring for the land and its resources to pass healthy ecosystems to future generations.

stocking level- The number of tree in an area as compared to the desirable number of trees for best results, such as maximum wood production.

stream classes- A means to categorize stream channels based on their fish production values. Also known as Aquatic Habitat Management Unit (AHMU) class. There are four stream classes defined by the Forest Plan:

15. *Class I: Streams and lakes with anadromous or adfluvial fish habitat; or high-quality resident fish waters, or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.*
16. *Class II: Streams and lakes with resident fish or fish habitat and generally steep (6 to 25 percent or higher) gradients where no anadromous fish occur, and otherwise not meeting Class I criteria.*
17. *Class III: Streams are perennial and intermittent streams that have no fish populations or fish habitat, but have sufficient flow or sediment and debris transport to directly influence downstream water quality or fish habitat capability. These streams have bankfull widths greater than 1.5 meters (5 feet) and have channel incision into the surrounding hillslope greater than 5 meters (15 feet).*
18. *Class IV: Intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to directly influence downstream water quality or fish habitat capability. Class IV streams do not have the characteristics of Class I, II, or III streams, and have a bankfull width of at least 0.3 meters (1 foot). These streams generally are shallowly incised into the surrounding hillslope. Incision depth may be determined from side-slope angle and length. Incisions from 3 to 5 meters in depth may be categorized as either Class III or Class IV depending on other stream characteristics.*
19. *Nonstreams. Rills and other watercourses, generally intermittent and less than 1 foot in bankfull width, showing little or no incision into the surrounding hillslope or evidence of scour.*

stream order- First-order streams are the smallest unbranched tributaries; second-order streams are initiated at the point where two first-order streams meet; third-order streams are initiated by the point where two second-order streams meet, and so on.

structure- How the parts of ecosystems are arranged, both horizontally and vertically. Structure might reveal a pattern, or mosaic, or total randomness of vegetation.

stumpage- The value of timber as it stands uncut in terms of dollar value per thousand board feet.

subsistence- Section 803 of the Alaska National Interest Lands Conservation Act defines subsistence use as "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

subsistence use area- Important Subsistence Use Areas include the "most reliable" and "most often hunted" categories from the Tongass Resource Use Cooperative Survey (TRUCS) and from subsistence survey data from ADF&G, the University of Alaska, and the Forest Service, Region 10.

Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

substantive comment- A comment that provides factual information, professional opinion, or informed judgment germane to the action being proposed.

succession- The natural replacement, in time, of one plant community with another. Conditions of the prior plant community (or successional stage) create conditions that are favorable for the establishment of the next stage.

successional stage - A stage of development of a plant community as it moves from bare ground to climax. The grass-forb stage of succession precedes the woody shrub stage.

suitability- The appropriateness of certain resource management to an area of land. Suitability can be determined by environmental and economic analysis of management practices.

sustainability- The ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time.

sustainable- The yield of a natural resource that can be produced continually at a given intensity of management is said to be sustainable.

sustained yield- The yield that a renewable resource can produce continuously at a given intensity of management.

target- A National Forest's annual goals for accomplishment for natural resource programs. Targets represent the commitment the Forest Service has with Congress to accomplish the work Congress has funded, and are often used as a measure of the agency's performance.

thermal cover- Cover used by animals against weather. For elk, thermal cover can be found in a stand of coniferous trees at least 40 feet tall with a crown closure of at least 70%.

thinning- A cutting made in an immature stand of trees to accelerate growth of the remaining trees or to improve the form of the remaining trees. Thinning is also used to improve the wildlife habitat by allowing more sunlight to reach the forest floor.

threatened species- Plant or animal species likely to become endangered throughout all or a specific portion of their range within the foreseeable future as designated by the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973.

threshold- The point or level of activity where an undesirable set of responses begins to take place in resource system.

tiering- Eliminating repetitive discussions of the same topic by incorporating by reference. The general discussion in an environmental impact statement of broader scope; e.g., this document is tiered to the Tongass Land and Resource Management Plan, as amended.

timber appraisal- Establishing the fair market value of timber by taking the selling value minus manufacturing costs, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

timber classification- Forested land is classified under each of the land management alternatives according to how it relates to be management of the timber resource. The following are definitions of timber classifications used for this purpose.

20. *Nonforest: Land that has never supported forests and land formerly forested where use for timber production is now precluded by development or other uses.*
21. *Forest: Land at least 10 percent stocked (based on crown cover) by forest trees of any size or land formerly having had such tree cover and not currently developed for nonforest use.*
22. *Suitable or suitable available: Land to be managed for timber production on a regulated basis.*
23. *Unsuitable: Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness) or identified as inappropriate for timber production in the forest planning process.*
24. *Commercial forest: Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.*

timber stand improvement (TSI)- Actions to improve growing conditions for trees in a stand, such as thinning.

Tongass Timber Reform Act (TTRA)- This act (1990) requires annual appropriations for timber management on the Tongass National Forest, with a provision providing for the multiple use and sustained yield of all renewable resources.

treatment area- The site- specific location of a resource improvement activity.

TSI – see timber stand improvement

TTRA- see Tongass Timber Reform Act

turbidity- An indicator of the amount of sediment suspended in water.

two-aged stands – Stands that contain two age classes of trees

type conversion- The conversion of dominant vegetation from forested to non-forested or from one species to another.

understory- The trees and woody shrubs growing beneath the overstory in a stand of trees.

uneven-aged management - Actions that maintain a forest or stand of trees composed of intermingling trees that differ markedly in age. Cutting methods that develop and maintain uneven-aged stands are single tree selection and group selection.

unregulated harvest- Tree harvest that is not part of the

allowable sale quantity (ASQ). It can include the removal of cull or dead material or non-commercial species. It also includes volume removed from non-suitable areas for research, to meet objectives other than timber production (such as wildlife habitat improvement), or to improve administrative sites (such as campgrounds.)

unsuitable lands- Forest land that is not managed for timber production. Reasons may be matters of policy, ecology, technology, silviculture, or economics

utility logs- Those logs that do not meet sawlog grade but are suitable for production of firm, usable pulp chips.

value comparison unit (VCU) – Distinct geographic area whose boundaries generally follow natural water divides.

variety class- A way to classify landscapes according to their visual features. This system is based on the premise that landscapes with the greatest variety or diversity have the greatest potential for scenic value.

vegetation management- Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

vegetation type- A plant community with distinguishable characteristics.

viable population- The number of individuals of a species sufficient to ensure the long-term existence of the species in natural, self-sustaining populations that are adequately distributed throughout their range.

viewshed- An expansive landscape or panoramic vista seen from a road, marine waterway, or specific viewpoint.

virgin forest- A natural forest virtually uninfluenced by human activity.

visual quality- The level of visual quality or condition presently occurring on the ground. The six visual condition categories are the following:

Type I: Natural condition. Areas where only ecological change has taken place. Corresponds to the Preservation visual quality objective (VQO).

Type II: Natural appearing. Areas where changes in the landscape are not noticed by the average forest visitor unless pointed out. Corresponds to the Retention VQO.

Type III: Slightly altered. Areas where changes in the landscape are noticed, but do not attract attention. Corresponds to the Partial Retention VQO.

Type IV: Moderately altered. Areas where changes in the landscape are easily noticed and may attract attention. Corresponds to the Modification VQO.

Type V: Heavily altered. Areas where changes in the landscape obviously appear to be major disturbances and stand out as a dominating impression of the landscape. Corresponds to the Maximum Modification VQO.

visual quality objective (VQO) - A set of measurable goals for the management of forest visual resources.

water table- The upper surface of groundwater. Below it, the soil is saturated with water.

water yield- The runoff from a watershed, including groundwater outflow.

watershed- The entire region drained by a waterway (or into a lake or reservoir. More specifically, a watershed is an area of land above a given point on a stream that contributes water to the streamflow at that point.

wetlands- Areas that are permanently wet or are intermittently covered with water.

wildlife analysis area (WAA)- A division of land used by the Alaska Department of Fish and Game for wildlife analysis.

wildlife habitat diversity- The distribution and abundance of different plant and animal communities and species within a specific area.

windthrow- Trees uprooted by wind.

wood fiber production- The growing, tending, harvesting, and regeneration of harvestable trees.

yarding- Moving the cut trees from where they fell to a centralized place (landing) for hauling away from the stand.

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